

## Subcutaneous Infection by a Botfly (*Dermatobia hominis*)– Case Study with Complications

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**Abstract:** The course of a subcutaneous infection on the forehead of a 60 years old patient by the maggot of the American Botfly *Dermatobia hominis* is described. Diagnosis was supported by an ultrasound investigation. For therapy a vaseline layer was applied onto the skin lesion thus closing the ductule used by the larva for breathing; the larva should thereby be expelled due to oxygen removal. The attempt by the patient to remove the larva by pressing failed; thereby, the larva was severely damaged, retracted into the cyst and died. This caused a strong secondary inflammation within the cyst with pus formation and significant anaphylactic reactions. After the larva could be removed from the cyst inflammation and swellings decreased completely within a few days. The reason for the strong inflammation after the removal failed is considered and a list of diagnostic characters as well as conclusions are presented.

**Keywords:** American botfly; *Dermatobia hominis*; Infection; myiasis; Mexico

### 1. INTRODUCTION

Parasitoses by flies (myiasis) are well known from various tropical areas but also from Europe. In Middle and South America the American botfly *Dermatobia hominis* (Modeer 1786) is widely distributed and has been documented to be introduced by tourists to Europe, North America, Israel and Japan [1, 2, 3, 4].

Vectors (mosquitoes, other parasitic flies, sometimes and mites) are included in the transmission of larvae of *D. hominis*: Gravid female flies wait close to pupating mosquitoes until their imaginal moult to attach their eggs to the imagoes. So mosquitoes serve as vectors transferring the eggs of *D. hominis* to their hosts. Larvae of *D. hominis* penetrate the skin of their host within 5 to 10 minutes after deposition and remain at the side of penetration. Within the next days a subcutaneous cyst develops to the size of a pea. Proteolytic bacteria introduced into the wound by the larvae destroy the host tissue thus providing food stuff for the larva.

These bacteria are not pathogenic, causing no inflammation. Thus, the maggot may survive within the cyst.

After its first moult the L2-larva starts to form a canal to the skin surface [4] by pushing their conically tapering posterior end through this canal to the skin surface for breathing.

Larval development within the host takes one to 4.5 months [4, 5], thereby increasing the cyst up to a diameter of 2.5 centimeters. Then the last instar larva leaves its host via the breathing canal and pupates in soil or litter. The pupal phase may last between one week and 2.5 months [5]. Humans but also other warm-blooded vertebrates may serve as hosts for *D. hominis*. Subcutaneous infections are the rule but other sites of infection (eyelid, fontanelle of babies, penis tip) have occasionally been recorded [3, 6].

In this case we report a strong inflammation and immune reaction, following an improper attempt to remove the larva thereby damaging and killing it.

## 2. CASE DESCRIPTION

### 2.1. Anamnesis

During a research expedition to Yucatan/Mexico where I stayed in the rainforest of Lacandona/Chiapas from mid of July to early August 2016 there was a subcutaneous infection by a botfly in the forehead of a 60 years old patient. On the day of departure the patient realized a small swelling at his forehead, which increased within the next days and became palpable as a bump. At this stage the canal between the cyst and the skin surface had been formed already, as scab eventually occurred. One week later strong pain

### 2.2. Diagnosis

Twelve days after the swelling had been noticed for the first time the patient visited his family doctor and described the symptoms referring to a probable infection during the Mexico visit.

within the forehead was first recorded (occurring 10 to 30 times per day, mainly at night). Pain events were correlated with the feeling that "something was moving" inside the cyst. The pain events continued, they were short-timed (3 until 10 sec, a maximum of 30 sec), but very strong awakening the patient from sleep during the night. At this time, the cyst was moderately sensible against pressure and increased successively and significantly in size. Further symptoms (fever, sickness) were not observed. A serosanguinous secretion was intermittently discharged from the skin lesion.

The physician made an ultrasound picture and a blood test. This ultrasound picture showed a 1 cm cyst underneath the scab on the forehead and within this cyst 2 – 3 mm cigar-shaped xenograft (fig. 1).



**Fig1.** Ultrasound picture of the forehead of the patient with the liquid filled cyst (diameter: 7 mm, distance from the skin surface: 4 mm). The 3 mm maggot is visible in the center of the cyst. (Photo: Dr Henry Hedrich, Görlitz)

A spontaneous interpretation of the result was not possible. In a telephone call a colleague, who had been working in Central America for decades and knew such symptoms, recommended an infection by a botfly. The next day the patient consulted a specialist for tropical medicine at the Städtisches Klinikum in

Dresden and showed the ultrasound picture. The following investigation supported the assumption that symptoms resulted from a botfly infection. The skin lesion was documented (fig. 2) and a conventional therapy was recommended.



**Fig2.** Scab on the forehead of the patient. Through the orifice underneath the maggot pushed its posterior end to the skin surface for breathing. (Photo: PD DrTeichmann)

### 2.3. Therapy

Vaseline was applied regularly onto the orifice of the ductule by the patient to interrupt the oxygen supply of the larva. By such oxygen removal the larva should be forced to leave the cyst so it could be removed. In botfly infections a treatment by surgery is neither necessary nor indicated as the larva leaves its host at the end of larval development and there are no lasting impacts on the patient. Only in very special cases [3, 6], a removal by surgery is indicated.

However, the patient did not strictly follow the recommended therapy for 3 days due to professional duties combined with public events. So he had to remove the Vaseline layer repeatedly for 0.5 to several hours. Briefly after removal of the Vaseline, movement of the larva within the canal was noticed and blood and lymphatic fluid poured out from the orifice.

### 2.4. Complications

In the afternoon of day 15 the patient noticed the posterior end of larva with the stigmata inside the opening of the canal. He tried to remove the larva by pressing (as indicated by [3]). At this time the wound canal had been closed with vaseline for hours. However, the removal failed probably as the larva anchored with its epidermal spines inside the wound canal. The attempt to remove the larva by digital expressing resulted in the damage of the larva and a separation of its posterior end from the rest of the body. (The small black spots found later in the opening of the canal most probably were the cuticular clasp of the stigmata as the posterior end was lacking when the larva was removed on day 17.) In the opening of the canal there was a soft transparent 2 mm long spindle-

shaped xenograft that the patient was able to pull out of the wound (which was most probably the posterior end of the larva). The rest of the larva had retracted into the cyst via the wound canal. After the removal had failed, severe secondary complaints occurred whereas priorly the course of the infection had been unproblematic (not regarding the pains during the night).

On day 16, the swelling on the forehead increased significantly and the patient had an impression of edema formation in the tissue surrounding the canal opening. So, the patient left work at 3 p.m. As the family doctor was not accessible, the patient bought hydroxychlorin (0.4%) at a pharmacy and applied it onto the lesion according to the instruction. At that time there were no secondary symptoms such as elevated skin temperature or pressure pain. An edema was not yet recorded.

At 4 a.m. next morning the patient awoke; an extreme edematous swelling covered his right face. The right eye was closed completely by a swelling, so he was not able to see. Underneath the left eye there also was a big edema (fig. 3).



**Fig3.** Strong large-scale edema formation on the face of the patient underneath the opening of the forehead (Photo: Helga Zumkowski-Xylander)

A bacteriological investigation was prompted and he was sent to the hospital. The physician prescribed an antibiotic (Cefuroxim 500mg, 1-0-1) and prednisolone (75mg: 3 d, 50mg: 3 d, 25mg: 3 d). After application the swelling



decreased over the day and at night the patient was able to see again with his right eye (but still limited).

Due to the further application of hydroxy-chinolin the scab covering the orifice weakened. At 11 p.m. some pus came out of the wound opening. Under moderate pressure close to the scab a large amount of pus plopped out. Thereby, the remnants to the maggot's body were set free as a whole. The larva was immotile and there was no pus attached to its surface.

### 2.5. Further Development

On day 17, the edema under the right eye was still large but smaller under the left eye. The swellings decreased further during the day. In the evening the edema under the left eye was even smaller, whereas under the right eye it was still strong and protruded. The swellings disappeared nearly completely during the following day. The bacteriological investigation from the opening showed a conventional *Staphylococcus aureus*. The blood sample (taken prior to the damage of the larva) was insignificant regarding CRP and leukocytes.

### 2.6. Morphology of the Damaged Larva



**Fig4.** Botfly maggot, habitus. The posterior end (bottom right) has obviously been torn.

The maggot was 2.5 mm long, belonging to the second larval stadium as indicated by body length, the relation between body spines and size as well as the time span from the first indications of the canal orifice (figs. 4 & 5). The anterior end of the larva had a high number of circularly arranged cuticular hooks all directed posteriorly. These hooks are used for movement within the wound canal and for anchoring.

(Such anchoring is the cause of the pain reported by patients.)



**Fig5.** Botfly maggot. Anterior end with a mouth opening and cuticular spines directed posteriorly. (Photos 4 & 5: Willi Xylander, Cornelia Wiesener, SMNG)

The caudal body tip with the stigmata had been removed by the patient. The posterior part left was transparent and slightly greenish to grey. The larva was stored in ethanol (40 %) for 2 days and subsequently documented using a stereomicroscope (figs. 4 & 5). Size, shape and arrangement of hooks in the larva were not completely identical with that of other larvae described from Southern and Central America [6].

### 3. DISCUSSION

Infections by *D. hominis* in Europe, North America and Israel have been documented nearly exclusively after journeys to Middle and South America [1, 3]. Initial diagnoses often do not consider myiasis. Diagnostic indications and characters for an infection with *D. hominis* are 1) the journey to a country from which such parasites are known, 2) formation of a cyst with a close by skin lesion and serosanguinous secretion, 3) short but strong pain events in vicinity of the cyst (especially at night) combined with the impression of a crawling sensation, 4) localisation of a "maggot-like xenograft" in the cyst by ultrasound (or other procedures) [3], 5) identification of the maggot's stigma plate in the wound opening [1].

Normally myiasis by *D. hominis* is unproblematic and ends up at the end of the larval stage by the last in star leaving the host or by medical removal. Subsequently, symptoms fade successively in the next about 10 days without further treatment.

In the case described here, however, the damage of the larva secondarily resulted in a strong

inflammation and immune reactions with severe edema. It remains unclear whether the strong anaphylactic reaction described was triggered a) by bacterial toxins of the secondary infection or b) by substances from the haemolymph of the larva causing allergic reactions. Bacterial toxins may have originated either from the primary bacterio-flora which could no longer be regulated by the larva due to its lethal injury or by bacteria introduced secondarily into the cyst by the retracting larva. In any case a supplementary antibiotic therapy was indicated as described for other cases after damage of *D. hominis* [3].

Regularly such bacterial infections and side effects are not observed during a normal botfly infection. Whether antibacterial substances known to be produced by dipteran larvae (overview in [7]) are involved in the homeostasis of the milieu of the cyst, still has to be investigated. In any case, the damage of the larva during the attempt of removal is considered to be responsible for the complications described. Therefore, removal of the maggot should be not done by the patient but under medical supervision.

#### 4. CONCLUSION

1. Infections with the *Dermatobia hominis* are wide spread in Central and South America. Such infections are transferred to the industrial states due to tourism.
2. If the symptoms described are recorded and anamnesis (trips to the spread areas) suggests such an infection, myiasis should be taken into account.
3. An investigation with ultrasound may help to confirm the diagnosis.
4. Application of an airtight cream layer, paraffin, nail polish or semipermeable foil for expelling the larva has clear priority against surgery [1,3]. Such simple procedures are fast and without side effects.
5. The therapy has to be continued without interruptions until the larva is expelled.
6. The damage of the maggot may have unpleasant side effects.
7. The patient has to be informed about the procedure of the treatment.
8. Expelling of the larva should be done by a physician.

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