

## Case Report

# Clinical management of maggot wounds in Bengal Tigers (*Panthera tigris tigris*)

Anup Kumar Talukder, Md. Aatur Rahman, Sang Hyoun Park, Mohammad Nizam Uddin Chowdhury, Md. Golam Haider, Tapan Kumar Dey, Abu Nasar Md. Aminoor Rahman and Ziban Chandra Das

• Received: Dec 22, 2016 • Revised: Jan 25, 2016 • Accepted: Jan 26, 2016 • Published Online: Jan 30, 2017



## AFFILIATIONS

- Anup Kumar Talukder
- Abu Nasar Md. Aminoor Rahman
- Ziban Chandra Das  
*Department of Gynecology, Obstetrics and Reproductive Health, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur 1706, Bangladesh.*
- Md. Aatur Rahman  
*Department of Surgery and Radiology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur 1706, Bangladesh.*
- Sang Hyoun Park  
*Department of Theriogenology and Reproductive Biotechnology, Chonbuk National University, Iksan Campus, South Korea.*
- Mohammad Nizam Uddin Chowdhury
- Tapan Kumar Dey  
*Bangabandhu Sheikh Mujib Safari Park, Gazipur 1741, Bangladesh.*
- Md. Golam Haider  
*Department of Pathobiology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur 1706, Bangladesh.*

## CORRESPONDENCE

**Ziban Chandra Das**  
*Department of Gynecology, Obstetrics and Reproductive Health, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur 1706, Bangladesh.*  
E-mail: [zibangor@bsmrau.edu.bd](mailto:zibangor@bsmrau.edu.bd)

## ABSTRACT

**Objective:** Maggot wound is common in domestic and pet animals but report on maggot wound treatment in wildlife species is scanty. The study reported here the surgical and conservative management of maggot wounds including anesthetic protocol and postoperative care in two Bengal tigers (*Panthera tigris tigris*).

**Materials and methods:** One female and one male tiger were presented with maggot wounds for treatment at the Bangabandhu Sheikh Mujib Safari Park, Gazipur, Bangladesh. Tigers were anesthetized with combined injection of xylazine (dosed at 1.0 mg/kg bwt, IM) and ketamine hydrochloride (dosed at 3.5 mg/kg bwt, IM). Superficial maggots were removed from wounds using sterile tissue forceps. Gauze soaked in oil of turpentine was allowed to remain in each wound pocket for 5 min for the removal of deep-seated maggots. Finally, wounds were dressed with tincture iodine to clean out the dead tissue debris and to induce inflammation for rapid healing. A single subcutaneous injection of ivermectin (dosed at 200 µg/kg bwt, IM) was given in each tiger. In addition, long acting oxytetracycline (dosed at 10 mg/kg bwt, IM) on 48 h interval for six days, chlorpheniramine maleate (dosed at 1 mg/kg bwt, IM) once daily for three days, and ascorbic acid (dosed at 250 mg/tiger, IM) once daily for seven days were administered in both tigers.

**Results:** The tigers were recovered successfully without any complications in two weeks following treatment.

**Conclusion:** Surgical management using oil of turpentine and tincture iodine along with parenteral administration of ivermectin, long acting oxytetracycline and chlorpheniramine maleate are effective for successful management of maggot wounds in Bengal tigers.

## KEYWORDS

Bengal tiger; Maggot wound; *Panthera tigris tigris*; Treatment

**How to cite:** Talukder AK, Rahman MA, Park SH, Chowdhury MNU, Haider MG, Dey TK, Rahman ANMA, Das ZC (2017). Clinical management of maggot wounds in two Bengal Tigers (*Panthera tigris tigris*). Journal of Advanced Veterinary and Animal Research, 4(1): 104-109.

## INTRODUCTION

Tiger (*Panthera tigris*) is the largest cat species belongs to the order Carnivora and the family Felidae. Among the eight recognized subspecies of tigers; five are living but classified as endangered and other three subspecies have become extinct for last sixty years. Bengal tiger (*Panthera tigris tigris*) is one of the living subspecies of tigers, also known as Indian tiger, native to Asia including India, Bangladesh, Nepal and Bhutan. The total adult population of Bengal tiger was estimated at 440 in the Sundarbans of Bangladesh ([Chundawat et al., 2011](#)). Sundarbans are the only mangrove habitat in this bioregion, where Bengal tigers survive, swimming between islands to hunt prey. On the other hand, Bangabandhu Sheikh Mujib Safari Park (BSMSP) has launched in 2013, which is the largest safari park in Asia and second safari park in Bangladesh after Dhulhajara Safari Park in Cox's Bazar District. The BSMSP has presently nine Bengal tigers which were imported from a South African game reserve in 2013.

The Bengal tiger, like most other large cat species, is vulnerable to a wide range of diseases that are similar to what a domestic cat is prone to infection, inflammation, parasitic infestation, degenerative disease and cancer. Myiasis is the parasitic infestation of tissue of a live mammal by dipteran larvae (maggots) that grow inside the host while feeding on its tissue causing more or less every traumatizing injury ([Hall et al., 1995](#); [Hall and Farkas, 2000](#)). This infestation eventually turns into maggot wound which causes annoyance to animals and disruption of normal feeding and resting habits. The mostly affected hosts for myiasis are cattle (46.4%) followed by dogs (15.3%), humans (14.7%), pigs (6.0%), horses (4.0%) and sheep (1.0%) ([Sergio et al., 2007](#)). Myiasis causes reduction in the production of meat, milk and wool in livestock species but in the case of wildlife, it leads to death of wild animals in captivity as well as in the free ranging wildlife ([Kumar and Raj, 2012](#)). There is a dearth of information about management of maggot wounds in wildlife. This case report describes the conservative and surgical methods of management of maggot wound in two Bengal tigers.

## MATERIALS AND METHODS

**Ethical statement:** All animal care and surgical procedures were undertaken in compliance with the ethical standards.

**Case-1:** A two years old female tiger (body weight 130 kg) was presented with a maggot wound on its back region.

**Case-2:** A two years old male tiger (body weight 150 kg) was presented with complaints of two maggot wounds one at his back region and another one at the right thigh. Both tigers had history of inappetance, restlessness and they used to rub their back regions against wall or trees of the territory.

### Anesthesia, surgical procedure and postoperative care:

The anesthesia and surgical procedure were same for both tigers. Each tiger was anesthetized by combined injection of Xylazine hydrochloride (Ilium Xylazil®, Troy Laboratories Pvt. Ltd., Australia) dosed at 1.0 mg/kg body weight (bwt) and Ketamine hydrochloride (Ketamil®, Troy Laboratories Pvt. Ltd., Australia) dosed at 3.5 mg/kg bwt intramuscularly (IM) using a blow pipe with 10 mL anesthetic dart. After anesthesia, skin over and around the wound was seen red, swelled and inflamed indeed (**Figure 1a, b**).

The wounds were evaluated for spreading and depthness of tissue involved. In case 1, the length, width and depth of the pocket of maggot wound were 7.0 cm, 6.0 cm, and 1.9 cm respectively. In Case-2, the length and width of back region wound were 4.0 cm and 3.0 cm, respectively while depth was 1.8 cm. The second wound located at right thigh did not form pocket rather it passed beneath the skin and formed a tract wound of 5.5 cm in length (**Table 1**).

Hairs around each wound were clipped using a curved scissors. Then the clipped area was shaved using a sterile shaving blade and draped with a surgical drape having a window fixed with four towel clips. The operative site was then painted with sterile gauze soaked in tincture iodine for disinfection of skin. Superficial maggots were removed from the wound pocket using sterile tissue forceps (**Figure 2a**). The wound pocket was also packed with a gauze dipped in oil of turpentine for 5 min to remove the deep-seated maggots. The live and dead maggots, those came out to the surface of wound, were removed using simple tissue forceps. After removal of all maggots present in wound (**Figure 2b**), sterile gauze soaked in tincture iodine was used to clean out the dead tissue debris and to induce inflammation. Thereafter, slight amount of sulphanilamide powder was sprinkled into the wound pocket.

A subcutaneous injection of ivermectin (Vermic<sup>®</sup>, Techno Drugs Ltd., Bangladesh) at 200 µg/kg bwt was given following operation. A broad spectrum antibiotic *vsz*, long acting oxytetracycline (Renamycin LA<sup>®</sup>, Renata Animal Health Ltd., Bangladesh) dosed at 10 mg/kg bwt was injected IM at the time of operation and then repeated twice at 48 h interval. Antihistaminic preparation (Chlorpheniramine maleate, Histavet<sup>®</sup>, Techno Drugs Ltd., Bangladesh) at 1 mg/kg bwt was

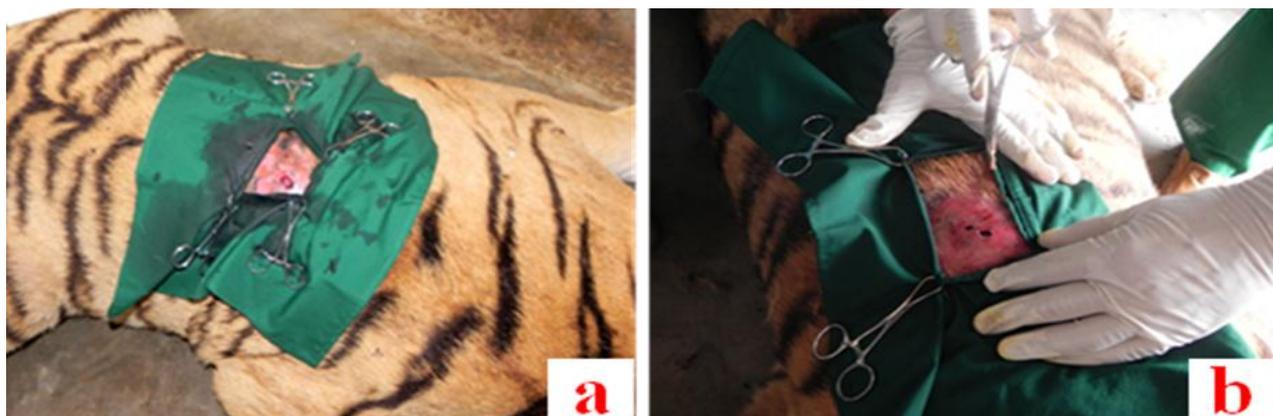
administered IM once daily for three consecutive days. Ascorbic acid (Ascason<sup>®</sup>, Jayson Pharmaceuticals Ltd., Bangladesh) dosed at 250 mg/tiger was injected IM once daily for seven consecutive days.

The treated wounds of both tigers were observed on third day of operation and found no maggots. The wounds were completely healed at day 12 of operation in both tigers (Figure 3a, b).

**Table 1.** Characteristics of maggot wounds found in two Bengal tigers

Case No.	Nature of wound	Length (cm)	Width (cm)	Depth (cm)	No. of larvae removed
1	Pocket wound	7	6	1.9	3
2	Pocket wound	4	3	1.8	7
	Tract wound	5.5	-	-	*

\*No larvae from tract wound were removed but tiger's attendant had seen some larvae came out of that wound a day earlier of operation.



**Figure 1.** Maggot wound after clipping and shaving (a) female and (b) male tiger.



**Figure 2.** Maggots or larvae of dipteran flies (a) one larva was removing from pocket wound using forceps (b) Collection of larvae placed on floor of the room.



**Figure 3.** Healed wound at day 12 of operation (a) female tiger (b) male tiger.



**Figure 4.** *Mon-kata* in the enclosure of tigers (a) a plant in the tiger's enclosure (b) a dry twig of *mon-kata* plant collected from tiger's enclosure.

## RESULTS AND DISCUSSION

During surgical procedure, anesthetized tigers were kept in lateral recumbency with extended head and neck with the tongue pulled a side to maintain open airways. The tiger's heads were covered by black cloth. The time between injection of anesthetic agent and loss of consciousness was 20 min for female tiger and 23 min for male tiger. The principles of anesthesia monitoring in tigers in this study were the same as for domestic cats. The tigers were monitored with great caution and physiological parameters were recorded. During the immobilization period, the vital health signs like heart rate, respiratory rate, color of mucous membranes and capillary refill time of animals should be monitored and recorded at 5 min intervals (Thurmon et al., 1996; Morris, 2001). The entire operative procedure was conducted in an enclosed and protected room to avoid outside disturbances for both tigers. Both tigers recovered from anesthesia completely without any complications in 8 h.

Abrasion on skin surface or open wound is a predisposing factor for cutaneous myiasis. Myiasis is a parasitic infestation and its incidence rate is higher in tropics, South–East Asia and subtropics of Africa where warm and humid climate prevail almost throughout the year and the causative predisposing factors are exposed to myiasis–causing flies and their increased aggressiveness (Bologna et al., 2008). Fairly it is common in field condition particularly in the season of fly prevalence (John, 1999). In this case report, authors observed that there was plenty of *Randiadumetorum* plant under the family Rubiaceae (locally called '*mon-kata*' in Bangladesh, **Figure 4a**) found in the tiger's enclosure in the BSMSP. Even, many dry twigs (**Figure 4b**) of these plants were found in that tiger's enclosure. Therefore, it was assumed that open skin wounds in tigers were made by sharply projected spine of *mon-kata* while rolling or resting on the ground. These wounds were then infested by larvae of dipteran flies and thus gradually developed into maggot wounds. Considering this point, we recommended for

immediate removal of the *mon-kata* plants and their dry twigs from tiger's enclosure.

The efficacy of oil of turpentine in the treatment of myiasis has been reported earlier ([Agarwal and Singh, 1990](#)). In the case study, application of oil of turpentine to the maggots wound helps removing maggots from the wound. Oil of turpentine also creates an anoxic condition in the wound pocket and as a result the maggots crawl out of the pocket within three to five min ([Bowe et al., 1977](#)). Moreover, oil of turpentine enhances ceruloplasmin activities which inhibit inflammatory injury by its antioxidant property ([DiSilvestro, 1989](#)).

Ivermectin is a broad spectrum anthelmintic drug effective against both ectoparasites and endoparasites including maggots ([Howard and Smith, 1999](#)). Earlier, it is reported that ivermectin blocks nerve impulses on the nerve endings through the release of gamma amino butyric acid (GABA), link to the receptors and cause palsy and death of both immature as well as mature parasites ([Campbell, 1985](#)). Furthermore, in another study reported that ivermectin was effective in healing of granulating wound without complication ([Sharma, 1994](#)). Although, ivermectin is a highly effective antiparasitic drug in domestic animals; however, data is very limited regarding efficacy and safety of ivermectin in wild animals. In this study, ivermectin was administered dosed at 200 µg/kg bwt like domestic animals.

Long acting oxytetracycline was administered (three injections at 48 h interval) to avoid secondary bacterial infection. Antihistaminic drug was used to counteract the histamine released by damaged tissue. Ascorbic acid (vitamin C) was injected once daily for seven consecutive days to promote the healing of wound. The ascorbic acid has antioxidant properties and its role in collagen synthesis make it to be a vital molecule for repair of damaged skin. ([Geesin et al., 1988](#)). Moreover, ascorbic acid has also roles in wound healing by promoting keratinocyte differentiation ([Savini et al., 2002](#); [Duarte et al., 2009](#)), stimulating the formation of epidermal barrier ([Boyce et al., 2002](#)), and re-establishing the stratum corneum ([Ponec et al., 1997](#)).

In this case report, maggot wounds were completely healed by day 12 of operation in both the tigers. On the contrary, [Rahman et al. \(2009\)](#) reported that 90.3% wound areas were healed by day 17 of operation for maggot wounds in cattle treated with ivermectin and broad-spectrum antibiotic. The rapid

wound healing in tigers in this report might be due to variation of species, rational use of antibiotic in these tigers unlike indiscriminate use of antibiotic in cattle in Bangladesh and an additional supplement of ascorbic acid. All these factors might have promoted the healing of wound.

## CONCLUSION

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It can be concluded that surgical management using oil of turpentine and tincture iodine along with parenteral administration of ivermectin, long acting oxytetracycline and chlorpheniramine maleate are effective for successful management of maggot wounds in Bengal tigers. The ivermectin is effective in tigers at the same dose used for domestic animals such as cattle, sheep and goat. Besides, ascorbic acid can be used to promote the healing of wound. The BSMSP has created an opportunity for education and research on various diseases of captive wildlife in Bangladesh.

## ACKNOWLEDGEMENT

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We thank the supporting staff of veterinary hospital of Bangabandhu Sheikh Mujib Safari Park, Gazipur, Bangladesh for their help during surgical procedures.

## CONFLICT OF INTERESTS

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The authors declare that they have no conflict of interest.

## AUTHORS' CONTRIBUTION

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Conceived and designed the experiments: AKT, MGH, TKD and ANMAR. Performed the experiments: AKT, MAR, MGH, and MNUC. Wrote and revised the manuscript: AKT, MAR, SHP, ANMAR and ZCD. All authors have read and approved the final manuscript.

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