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A SECOND-DEGREE THERMAL BURN IN A BURMESE PYTHON (*PYTHON BIVITTATUS*) - CASE INSIGHTS AND THERAPEUTIC APPROACHES

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ABSTRACT

Thermal burns are common in reptiles kept as pets. This report describes a clinical case of thermal burn in a pet snake. The patient is a 3-year-old female amelanistic Burmese python (*Python bivittatus)* with a second-degree thermal burn due to a malfunction of the heating mat. Erythematous and necrotic areas were inspected on the ventral scales. The treatment included iodine baths, burn dressing, application of topical ointments, and systemic antibiotics, as well as physiotherapeutic procedures. Thermal burns in snakes should be treated with a multisystemic approach.

Key words: thermal burn, python, multisystemic treatment, physiotherapy

INTRODUCTION

Thermal burns constitute a prevalent pathological condition in captive reptiles, frequently attributed to improperly designed or malfunctioning artificial heating systems. As poikilotherms, reptiles rely on exogenous heat sources (heating rocks, mats, or lamps) to maintain optimal physiological function (Ewart, 2020), predisposing them to thermal injuries.

The integumental reaction to injury in reptiles is similar to the mammalian, consisting of vascular and inflammatory responses, followed by dermal and epidermal restoration. Studies show that the inflammatory response is greater in snakes, compared to lizards (Mitchell and Diaz-Figueroa, 2004), and that Boas and Pythons are more predisposed to dermatological lesions than other snakes (White et al., 2011).

The incorrect captive conditions or a malfunction of the heating source may result in thermal burns, classified as first-, second-, and third-degree (Mitchell and Diaz-Figueroa, 2004; Martinez-Jimenez and Hernandez-Divers, 2007), overviewed in Table 1. Fourth-degree burns are third-degree burns referred to as full-thickness burns and affect muscles and bones as well – these alterations typically result in nerve-ending destruction and are often less painful (Music and Strunk, 2016).

Table 1: Overview of thermal injuries classification and standard treatment.

Burn Degree	*Tissues involved*	*Clinical presentation*	*Choice of treatment*
I	Epidermis (superficial)	Erythematous, moist dermatitis	Cool compresses
II	Epidermis and middermis (deeper partial thickness)	Blister formation and necrosis of the skin	Antiseptic creams, analgesics, antibiotics,
III	All skin structures and fat (full-thickness)	Necrosis of the integument and muscles	Additional resection, skin grafts
IV	Underlying tissues and bones	Charred tissues with eschar	Excision (grave prognosis)

Although thermal burns in reptiles have been documented in veterinary literature, current treatment protocols are predominantly extrapolated from mammalian models. Suboptimal management of these burns can result in significant morbidity, including the proliferation of opportunistic pathogens, progressive tissue necrosis, and systemic inflammatory responses that may compromise overall health.

The presented case report aims to highlight the challenges and considerations in the clinical management of second-degree burns in a python, emphasizing the necessity of a multisystemic, evidence-based therapeutic strategy. The inclusion of physiotherapeutic procedures such as UV irradiation therapy, alongside antiseptic wound management, systemic antimicrobial administration, and targeted fluid resuscitation, provides critical insights into optimizing burn treatment in snakes. As reptiles become more popular the authors consider that a publication about one of the most common skin conditions related to poor husbandry would be of great use to practicing veterinarians, zoologists, and reptile owners.

CASE PRESENTATION

The patient was a 3-year-old female amelanistic Burmese python (*Python bivittatus*, Kuhl 1820), weighing 5 kg. The snake was kept in a glass enclosure with cold and warm zones provided by a heating mat. Based on the anamnesis the burning event occurred due to a malfunction of the mat shortly after the ecdysis. The animal was presented to the *University Clinic for Small Animals* at the Faculty of Veterinary Medicine (University of Forestry, Sofia) two weeks after the event. During the physical examination damaged skin on the ventral surface of the caudal third of the body was observed. The burned area had brown scales peeled in some regions, indicating the underlying dermis (Fig. 1A-B).

Figure 1: Second-degree burn in Burmese python.

Debridement of the damaged tissue was done, and the affected zones were cleaned with a *0,05% chlorhexidine solution* (Dermanios Scrub, Anios®) (Fig. 2A). The more severe areas were dressed using gauze and skin-stay stitches (Fig. 2B-D). Pama Veyxal ointment (Veyx-Pharma®) was applied under the dressing for the first seven days, and after that Dermazin 1% cream (Sandoz, Salutas®) without dressing. Before placing the topical products, the snake was soaked in a warm bath for 20 minutes – 5 L of water with 10 mL *povidone-iodine* (Iodaseptone 10%, Chemax Pharma®). During the first week, the body's ventral side was irradiated with ultraviolet rays 160-400 nm for 30 seconds with a quartz lamp (Helios Quartz 125W, Philips®) from a 1 m distance.

Systemic therapy included *enrofloxacin* (Baytril 5%, Bayer®) for 10 days in a dose of 10 mg/kg i.m. q 24 h, *ascorbic acid* (Vitamin C inj. sol., Bioveta®) for 7 days in a dose of 20 mg/kg i.m. q 24 h, and *meloxicam* (Meloxidolor 0,5%, Le Vet Beheer B.V.®) for 5 days in a dose of 0,2 mg/kg q 24 h. Fluid therapy was administered for 10 days with *sodium chloride* (NaCl 0,9%, B. Braun®) in an amount of 10 mL/kg s.c. every day. All the used dosages of the administered drugs in the presented clinical case report were according to Carpenter et al. (2019).

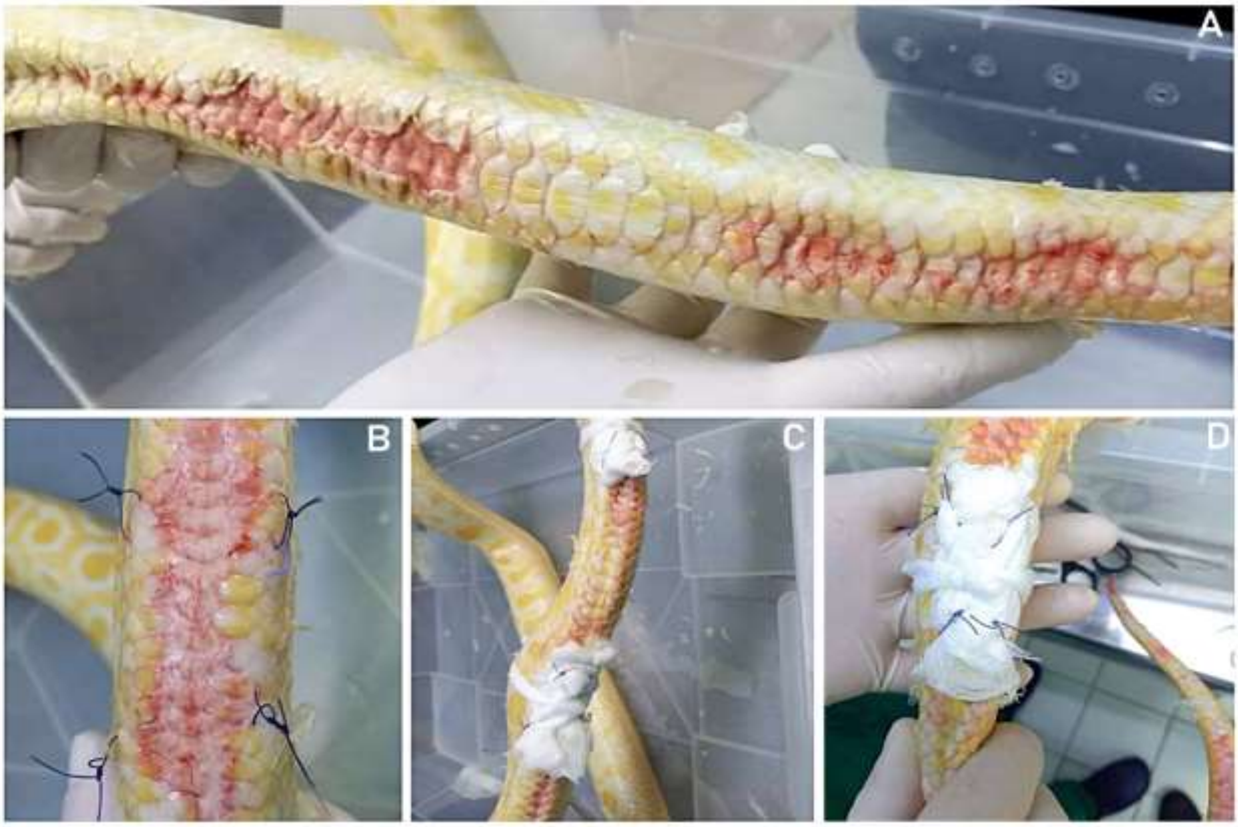

Figure 2: Debridement and tie-over bandages on the snake's ventral site. A: Antiseptic cleaning. B: Several skin-stay sutures are loosely placed around the more damaged areas. C, D: Sterile gauze squares are placed and tied with a bandage through the loops.

After 17 days of therapy, the snake was discharged, with visibly improved skin condition, without additional home treatment. During the therapy, and until full recovery, it was not kept on a substrate, but on clean kitchen paper. The snake was followed up with clinical examinations on the 1st (Fig. 3A-B) and 6th (Fig. 3C-D) month after the burn treatment.

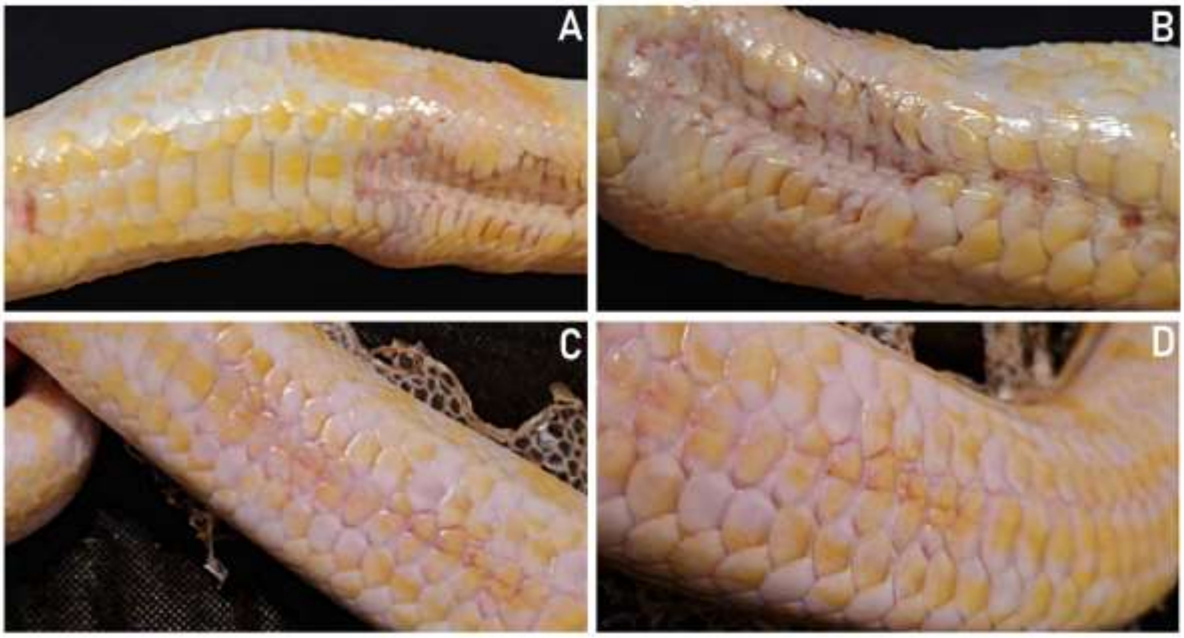

Figure 3: Inspection of the ventral site 1 month (A, B) and 6 months (C, D) after treatment.

DISCUSSION

Burn injuries in reptiles present unique clinical challenges due to their distinct integumentary structure and physiology. Cleaning and flushing the wound to remove dirt and debris and reduce the potential pathogenic load can promote the wound healing process. The European Wound Management Association considers this procedure an essential requirement for initiating the physiological process of tissue repair (White, 2015). Therefore, it is important to perform timely surgical treatment (in some cases after appropriate general or local anesthesia) before proceeding with chemical and drug therapy for burns. Once the wounded area is cleaned and debrided it could be classified as “clean but contaminated” (Vella, 2004). It’s necessary to follow up with a mild antiseptic solution: 0,05% chlorhexidine or 0,1% povidone-iodine. At these concentrations, they will not damage the newly regenerating delicate tissues in the affected area (Vella, 2004).

The proteolytic enzymes included in the first ointment applied showed promising results in treating the injury. Several studies (Arablo et al., 2016; Shah and Mital, 2018; Isabela Avila-Rodríguez et al., 2020) confirm that the use of trypsin and chymotrypsin preparations promotes faster recovery and better resolution of inflammatory signs and symptoms due to tissue injury and that these enzymes demonstrate analgesic effects and reduce pain associated with healing. The sterile tie-over bandages used to cover the burned areas were applied as reported by Mickelson et al. (2016) to keep the ointment in place and to protect the skin from secondary opportunistic infections. From our experience, the tie-over bandages proved to be quite effective on the snake’s body, as they prevented the bandage from slipping off and limited the additional stress on the patient during daily dressing changes.

Topical treatment was then continued by applying a cream containing silver ions as reported by other authors (Atiyeh et al., 2007; Goodman, 2007). Mitchell and Diaz-Figueroa (2004) recommend a standard protocol of thermal burn management, which also includes silver sulfadiazine to prevent the desiccation of viable tissues. The antibacterial action of silver ions is achieved by binding to tissue proteins, which structurally alter the bacterial cell membranes. Silver denatures bacterial DNA and RNA, thus inhibiting replication (Munteanu et al., 2016). In vitro studies have shown that silver sulfadiazine induced the retardation of wound closure rate by inhibiting the keratinocyte and fibroblast growth (Lee et al., 2005). The rationale for its use extended beyond promoting wound healing to include reducing wound bioburden, managing local infections, and preventing the systemic spread of pathogens (Leaper, 2012).

The most common burn treatment protocols include also systemic broad-spectrum antimicrobial medications, such as a fluoroquinolone or third-generation cephalosporin (Mitchell and Diaz-Figueroa, 2004). We have chosen enrofloxacin as an antimicrobial agent commonly used in reptile medicine due to its favorable pharmacokinetic profile and therapeutic index (Salvadori et al., 2015). The formation of its active metabolite ciprofloxacin contributes to the antimicrobial efficacy against a broad spectrum of gram-negative and some gram-positive microorganisms (Walker et al., 2000; Agius et al., 2020). In our experience snakes can develop scale and skin lesions after enrofloxacin injections, as reported by other authors (Fitzgerald and Newquist, 2013; Petritz et al., 2013), therefore we recommend diluting the drug with saline after the single injection dosing before intramuscular administration.

Subcutaneous fluids can also be used to rehydrate patients with mild dehydration. Fluid deficits can be replaced over 48 to 96 hours for the chronically dehydrated reptile (Martinez-Jimenez and Hernandez-Divers, 2007), but we continued rehydration for 10 days, as long as the antimicrobials were administered, as indicated by Eatwell (2007) and Mader (2008). Some authors recommend avoiding subcutaneous fluids in snakes, as the subcutaneous space does not readily accept large volumes; however, this is species-specific, and a small amount can be administered to multiple subcutaneous sites if necessary (Gibbons, 2009). In the presented clinical case, the whole volume of fluids was administered according to the last.

Burn injuries trigger an inflammatory state marked by elevated capillary permeability, which causes protein and fluid leakage into surrounding tissues and amplifies resuscitative demands. While the mechanisms driving this increased permeability are intricate, reactive oxygen species play a significant role, and antioxidant therapy has proven effective in mitigating their effects across various conditions (Rizzo et al., 2016). Despite their potential, the role of antioxidants in burn treatment is not yet fully understood. Matsuda et al. (1991) investigated vitamin C as a promising antioxidant in burn resuscitation studies, demonstrating its effectiveness in lowering fluid requirements in burned guinea pigs. Based on the above we chose to include vitamin C in the treatment plan.

The use of physiotherapy procedures in wound healing is broadly observed and investigated in mammals (Davidson et al., 1991). UVB light (280–315 nm) is suspected to be a potential modulator of keratinocyte–melanocyte biology (Rennekampff, et al., 2010) postburn and has been directly applied to wounded tissue to stimulate the healing processes (Gupta et al., 2013). The UV light range from 180 to 280 nm has a strong ozonizing effect. Strong bactericidal effects are observed at a wavelength of 265 nm (Takada et al., 2017). We decided to include UV irradiation as a supporting part of the treatment plan, but we could not confirm or decline its healing potential in snakes. More in-depth studies are needed on the effectiveness of irradiation with quartz lamps in treating skin diseases in reptiles.

The prognosis for thermal burns in snakes depends on the condition's severity and an effective therapeutic approach. Appreciation of the natural behavior of reptiles, and the establishment of an appropriate and safe thermal environment are necessary (Pees and Hellebuyck, 2019). As reptile ownership continues to rise, the veterinary specialists must advance evidence-based treatment protocols to ensure optimal care for these animals. Collaboration between herpetologists, veterinarians, and reptile enthusiasts is essential to improving clinical outcomes and enhancing the overall welfare of captive reptiles.

CONCLUSION

Second-degree thermal burns in snakes should be treated with a multisystemic approach. This case report highlights the importance of a comprehensive and species-specific approach to managing thermal burns in reptiles. Effective treatment involves early debridement, proper wound antisepsis, and a combination of systemic and topical therapies to mitigate infection, promote healing, and manage inflammation. The successful recovery of this Burmese python underscores the importance of targeted treatment, integrating antiseptic baths, burn dressings, systemic antibiotics, anti-inflammatory medications, and physiotherapeutic interventions such as UV irradiation. Improving the captive conditions and taking precautions regarding future thermal incidents is important.

Beyond treatment, this case emphasizes the critical role of preventive care and proper husbandry in mitigating the risk of thermal burns in captive reptiles. Owners and veterinarians must be educated on safe enclosure heating practices and the importance of routine health monitoring to detect injuries early. Future research should explore the long-term effects of UV therapy on reptilian wound healing and assess alternative antimicrobial strategies to minimize adverse reactions associated with intramuscular injections.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interest for the current clinical case presentation, authorship, or publication.

ETHICAL REQUIREMENTS STATEMENT

The authors affirm that all procedures performed during diagnosis and treatment complied with relevant animal welfare regulations and ethical guidelines. The pet's owner consented to the use of clinical data and any associated images in this clinical case report.

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