Research Article

Light Therapy (Phovia) in Canine Panniculitis: Presentation of a Clinical Case

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Abstract | This article presents a clinical case of panniculitis in a 10-year-old German Shepherd dog treated with fluorescent light therapy (Phovia®) at the DERMAVET Veterinary Hospital. Panniculitis, an inflammation of the subcutaneous adipose tissue, can be caused by infections, drug reactions, neoplasia, and other factors; however, in many cases, the cause is unknown and is called idiopathic nodular sterile panniculitis. Standard treatment usually includes glucocorticoids and immunosuppressants, but these have side effects with prolonged use. Fluorescent light therapy, a non-pharmacological alternative, employs photobiomodulation with an LED device and a gel that converts light into fluorescent energy to stimulate healing and reduce inflammation. In the described case, the dog had severe and painful lesions with secondary infections, which did not improve with previous treatments. Weekly application of Phovia® therapy showed rapid improvement, reducing lesions and inflammation in four sessions. After three months of additional treatment with cyclosporine and a reduction of glucocorticoids, the dog made a complete recovery, showing that light therapy may be beneficial for cases of complex panniculitis in dogs.

Keywords | Fluorescent light therapy, Photobiomodulation, Adipose tissue inflammation, Veterinary dermatology

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INTRODUCTION

Inflammation of fatty (adipose) tissue is known as panniculitis, which may spread to the deep dermis. This reaction is exacerbated by the release of lipids from damaged adipocytes that undergo hydrolysis and saponification of their molecules, forming proinflammatory fatty acids and granulomatous tissue reactions (Abdelsalam and Mursal, 2018; Dal-Bó *et al*., 2012). The causes of panniculitis are varied, it is possible that it may be due to an infectious origin (fungi and bacteria), reactions to medications, nutritional (vitamin E) vascular, tumors, kidney, pancreatic, liver, pancreatic or Autoimmune disease and physicochemical changes (foreign bodies, injection inflamation). However, when the cause cannot be determined, it is known as idiopathic sterile nodular panniculitis (NSP) (Boynosky and Stokking, 2013; Dal-Bó *et al*., 2012). This syndrome can also be found under other names such as; sterile granulomatous/pyogranulomatous dermatitis, sterile granuloma/pyogranuloma syndrome and sterile panniculitis. In most

cases, identifying the exact etiology can be difficult, because affected dogs have similar clinical signs and histopathological features (Kim *et al*., 2011; Schissler, 2019).

The treatment used to treat this condition usually includes glucocorticoids, cyclosporine and/or tetracycline with niacinamide (Contreary *et al*., 2015). In some cases, wound care and treatment with analgesia are necessary in case of deep and severe ulcers. (Schissler, 2019). Most cases require long-term (sometimes lifelong) treatment and therefore adverse effects may be a concern (Kim *et al*., 2011).

In canine dermatology, a non-pharmacological alternative has been described, represented by photobiomodulation (PBM), such as fluorescence light energy (FLE) that uses photons at different wavelengths of visible light, produced by a device (chromophore gel and LED lamp) and at a non-thermal irradiance, to help in different biological activities and thus promote tissue restoration (Marchegiani *et al*., 2022; Marchegiani *et al*., 2023; Marchegiani *et al*., 2024). FLE has shown a reduction in antibiotic therapy time (and time needed for healing) in conditions such as deep and interdigital pyoderma when administered as an adjunctive therapy (Marchegiani *et al*., 2022). As well as supporting increased speed of infection control, it also favors the three phases of healing. FLE has been shown to promote re-epithelialization, reduce skin inflammation and improve matrix generation in canine surgical wounds (Marchegiani *et al*., 2020). This article, present the case of canine panniculitis treated with light therapy (PHOVIA®, VETOQUINOL).

Figure 1: Multiple eroded-ulcerated lesions and fistulous tracts of different sizes in the elbows (A), right shoulder (B), hip (C) and anus (D), some with serosanguineous suppuration (Miranda, 2024).

Case Description

A 10-year-old, 27 kg, unneutered male German Shepherd, housed in a backyard and not living with other dogs, was presented for dermatological consultation. He presented with multiple suppurative lesions in different areas of the body (Figure 1), bad odor, difficulty walking, generalized pain, hyporexia and itching. The owner reported that similar episodes of these lesions had occurred before and at that time had been controlled with antibiotic and anti-inflammatory medication, however the lesions returned, previously the lesions had not been so serious and deep. The lesions begin with the appearance of a callus that later bursts and suppurates.

On clinical examination the patient had elevated pain levels, was only able to stand for short periods of time with great difficulty, had poor musculature and a low World Small Animal Veterinary Association body condition score (3/9). He had pyrexia (39.5°C), an extremely deteriorated state with body weakness and decay, hyporexia, lack of energy and mental alertness. On dermatological examination he had mild diffuse thinning of the coat, multiple eroded, fissured and serosanguineous lesions on different body regions (elbows, abdomen, flanks, lateral and ventral thorax, neck, anus and lips). Multiple ulcers were scarred and crateriform in appearance and generalized lymphadenopathy.

Hair around the lesions was clipped, and discharge was sampled from the inside of the ulcers by swab and from the outside by imprint for cytology. Each sample was placed on a slide, air-dried, and stained with Diff-Quick (JorVet, Jorgensen Laboratories, LLC). Slides were examined by microscopic examination of at least four high-power fields (400x). Blood samples were taken for complete blood count and serum chemistry profile. Hematological analysis revealed mild anemia (packed cell volume: 33.1%, normal interval: 37.3–61.7%) and leukocytosis (white blood cell count: 43.28 K/µL, normal interval: 5.05–16.76/µL; neutrophils: 38.14 K/µL, normal interval: 2.95–11.64 K/µL; monocytes: 3.65 K/µL, normal interval: 0.16–1.12 K/µL). Blood chemistry test revealed hypoalbuminemia (albumin: 1.6 g/dL, normal interval: 2.5–4.4 g/dL) and increased globulin level (6.5 g/dL, normal interval: 2.3–5.2 g/dL). Cytology taken from the suppurating lesions consisted almost exclusively of numerous neutrophils showing a moderate degree of degenerative change and foamy macrophages. Staining revealed no evidence of bacteria or fungi. Imprint cytology of skin ulceration and drainage tracts revealed secondary infection with coccoid bacteria.

The owners refused further studies at that time due to the patient's deteriorating condition and financial resources, so the dog was started on oral prednisone (Meticorten®, Aspen), 1 mg/kg/day, gabapentin 10 mg/kg/BID (Leidofs®, Alphachem), Doxycycline 10 mg/kg/BID (Doximed-30®, Mederilab), daily multivitamin 1 time daily (Nutriplus tabs®, Virbac), all orally, complete baths with chlorhexidine/miconazole shampoo (Biohex shampoo®, Vetbiotek) 1 time weekly, and cleaning of the lesions with electrolyzed superoxidation solution (VeteriBac®, Esteripharma) 1 time daily, however the cleaning and baths indicated to the owner were not carried out continuously due to carelessness, against medical advice. The dog came to the hospital once a week to carry out cleaning of the lesions together with light therapy (PHOVIA®, Vetoquinol) (Figure 2). At each

visit to perform the procedure with light therapy (PHOVIA®, Vetoquinol), the lesions to be treated were previously cleaned with saline solution and electrolyzed superoxidation solution (VeteriBac, Esteripharma), a new topical photoconverter gel was prepared and spread directly on the lesion and affected skin, forming a layer approximately 2 mm thick. The PHOVIA lamp (blue light-emitting diode (LED) device) was then placed on the skin at a distance of about 5 cm during 2 minutes, then the gel was removed using a gauze soaked in saline solution to repeat the procedure and perform 2 cycles of therapy, thus performing 2 cycles once a week, obtaining rapid healing and less dermal inflammation (Figure 3 and 4).

Figure 2: Light therapy (PHOVIA) in one of the lesions (Miranda, 2024).

Figure 3: Same injuries as in Figure 1, elbows (A), right shoulder (B), hip (C) and anus (D) after 2 therapies with phovia performing 2 cycles once a week (Miranda, 2024).

Figure 4: Shoulder (A) and hip (B) injury after 3 Phovia therapies performing 2 cycles once a week (Miranda, 2024).

One month later, the lymphadenopathy had resolved, the patient's appetite was improved, he moved with greater agility and spirit, there were no new skin lesions or itching, only residual multifocal scars, and a healing lesion on the hip remained. The patient was started on cyclosporine at 5 mg/kg once daily (SID) (Atopica®, Elanco), the dose of prednisone was reduced, and doxycycline was discontinued. After approximately 3 months, the patient fully recovered from the lesions, regained weight, hair, and mobility (Figure 5). He is now continuing with cyclosporine 5 mg/kg/SID. The precise origin of the panniculitis is inserted, however, based on the anamnesis, medical check-up, cytology, and blood tests, our diagnosis was secondary panniculitis and suspected food allergy.

Figure 5: Shoulder (A), elbow (A) and hip (B) injury fully recovered (Miranda, 2024).

RESULTS AND DISCUSSION

Panniculitis can be the consequence of different disease processes that affect the components of the subcutaneous fat layer. Idiopathic and sterile cases have been reported as

the most frequent cause of canine panniculitis (Abdelsalam and Mursal, 2018). Lesions that occur as a result of tissue inflammation can be seen distributed in a generalized or focal manner in multiple forms or be unique. Lesions often present as deep nodules with or without drainage tracts, fistulas, plaques, and pyogranulomatous ulcers of variable size, extent, and severity that may drain an oily to hemopurulent discharge. Ulcers may range from small to very large and may extend into the muscle layer. Concurrent clinical signs include pyrexia, lameness, lethargy, vomiting, inappetence, and lymphadenopathy. Inflammation in canine panniculitis may be primarily lobular or septal, with or without vasculitis, and infiltration may be predominantly neutrophilic, lymphocytic, pyogranulomatous, or granulomatous, depending on the cause and stage of the disease (Boynosky and Stokking, 2013; Contreary *et al*., 2015; Schissler, 2019). In the present case, the patient presented deep, severely inflamed lesions infected with opportunistic bacteria that could be complicating the disease secondary to constant exposure of the lesions to the environment. Pharmacological therapy that is often included in conjunction with corticosteroids includes tetracycline antibiotics such as doxycycline and niacinamide as well as immunosuppressive medications such as cyclosporine, azathioprine, and chlorambucil (Contreary *et al*., 2015).

The Fluorescent Light Energy (FLE) system consists of a blue light-emitting diode (LED) device that activates a topical photoconverter amorphous hydrogel (carbopol-based), when activated by the LED lamp, chromophores contained in the gel release photons at different wavelengths within the visible light spectrum generating fluorescence. The use of this tool has demonstrated favorable results in the treatment of dermatological conditions as well as chronic wounds and an excellent safety profile in dogs (Mosca *et al*., 2023; Salvaggio *et al*., 2020). The operating principle of this device is based on the ability of the chromophore molecules contained in the photoconverter gel to capture the light emissions from the LED lamp and convert them into lower-energy photons at different wavelengths (fluorescence), influencing the three phases of healing. FLE helps to decrease the inflammatory process by attenuating TNFa and interleukin (IL)-6, promoting cell proliferation (fibroblasts, keratinocytes) and matrix synthesis in canine surgical wounds as it controls the expression of key biological mediators such as factor VIII, epidural growth factor and tumor necrosis factor (TNF) alpha, thus promoting wound healing. Angiogenesis is supported by elevated growth factors. It modulates cellular activity through mitochondrial biogenesis with an approximately 90% increase in mitochondria thus supporting the healing process. There is also an increase in collagen (substantial for remodeling) and decorin (maturation of new tissue). As a result, healing is promoted, thus shortening the time of systemic treatment and a faster resolution of the infection, favoring the control of both immune-mediated and inflammatory diseases (Apostolopoulos and Mayer, 2020; Marchegiani *et al*., 2020; Marchigiani *et al*., 2021; Salvaggio *et al*., 2020). In this case, FLE was responsible for a decrease in the duration of systemic analgesic, antibiotic and steroid therapy when administered as adjunctive therapy. Alternative therapies, such as in this case photobiomodulation therapy, for canine panniculitis could be beneficial especially when lesions are severe and may have secondary infections. The average time to achieve clinical resolution has been seen to be 4 to 8 weeks, however, more time is likely to be necessary (Marchigiani *et al*., 2021).

The number of visits this patient made to undergo PHOVIA therapy was only four, with two sessions per visit (1 per week) due to time, distance and economy, and although it was not possible to continue the therapies until the lesions were completely resolved, the time he remained with the therapies, the patient's improvement was 90% of his lesions, leaving one lesion still open, which continued to be treated without the therapy.

CONCLUSIONS AND RECOMMENDATIONS

This case study documents the successful use of fluorescent light energy (FLE) therapy through the Phovia® system as a complementary treatment in a dog with severe, refractory nodular panniculitis. The rapid clinical improvement observed after only four weekly FLE sessions with a 90% reduction in lesions suggests that this therapeutic modality has high potential to accelerate the resolution of complex inflammatory lesions and improve the quality of life in patients with chronic skin conditions.

The physiological mechanisms previously documented such as the modulation of pro-inflammatory cytokines, stimulation of cellular proliferation, collagen synthesis, and angiogenesis support the effectiveness observed in this case, even though direct histopathological measurements were not performed. Furthermore, the implementation of FLE allowed for the progressive reduction of glucocorticoids and antibiotics, which represents a significant advantage in avoiding the adverse effects of prolonged pharmacological treatment.

Despite logistical limitations (such as reduced application frequency and inconsistent adherence to home care), the clinical outcomes were notably positive, highlighting the therapeutic value of FLE even in constrained clinical settings. Therefore, it is recommended to expand clinical evidence through controlled studies with a larger number of cases, including pre- and post-treatment biopsies and digital imaging techniques to objectively measure lesion pro-

gression. Standardized FLE application protocols should be established for patients with panniculitis, defining the optimal number of sessions, frequency, and combination with immunomodulatory or antibiotic therapies, according to the severity of the lesions. Enhancing owner education is essential to ensure adherence to home care. This may include visual aids, remote follow-up (teleconsultation), automated reminders, and continuous educational reinforcement. In addition, quality-of-life metrics for both the patient and caregiver should be integrated into future studies, using validated models, to comprehensively assess the therapeutic impact of FLE in veterinary medicine.

AUTHOR'S CONTRIBUTIONS

Camilo Romero Núñez: Conceptualization, Methodology, Software, Validation, Formal Analysis, Data Curation, Writing – Original Draft, Supervision, Project Administration. Laura Miranda Contreras: Resources, Software, Validation, Formal Analysis, Data Curation, Writing – Review & Editing. Ariadna Flores Ortega: Investigation, Writing – Original Draft, Writing – Review & Editing, Visualization. Ariadna Flores Ortega Resources, Methodology, Review & Editing, Visualization. Camilo Romero Núñez: Resources, Methodology, Review & Editing, Visualization

Conflict of Interest

The authors have declared no conflict of interest.

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