

Canine surgical wounds: Harnessing the power of *fluorescent light energy* to promote the skin regeneration process



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INTRODUCTION

Wound healing is a complex biological process comprised of a series of sequential events aiming to repair injured tissue.

It starts immediately after injury and it requires a synchronized interaction among cells, growth factors and extracellular matrix proteins. Multiple factors influence this process, including blood supply, skin defect size, tension, mobility, susceptibility to infection, type of wound and condition of the underlying tissue. Excessive, continuous and chronic inflammation may affect healing and prevent the return to normal tissue function, resulting instead in the formation of disoriented connective tissue.

This abnormal architecture reduces mechanical strength of tissues and leads to scar formation.



AIM OF THE STUDY

The study aimed to **evaluate the effect of Fluorescent Light Energy (FLE)** on the healing of cutaneous incisional wounds.

MATERIAL AND METHODS

Ten healthy client-owned dogs undergoing orthopaedic surgery were prospectively recruited.

- **50% of the length of the surgical wound** was cleaned with sterile saline solution and treated with FLE, beginning the first day after orthopaedic surgery (T0) and continuing every 3 days until day 13 (T4).
- **50% of the length of the surgical wound** was only cleaned with sterile solution.

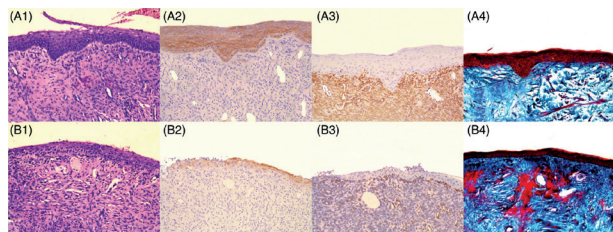
Surgical wound evaluation consisted of:

- **Clinical assessment** (ASEPSIS scale) taken from T0 to T4,
- **Histological** (semiquantitative score) and **immuno-histochemical analysis** of treated and control samples taken at T4.

RESULTS

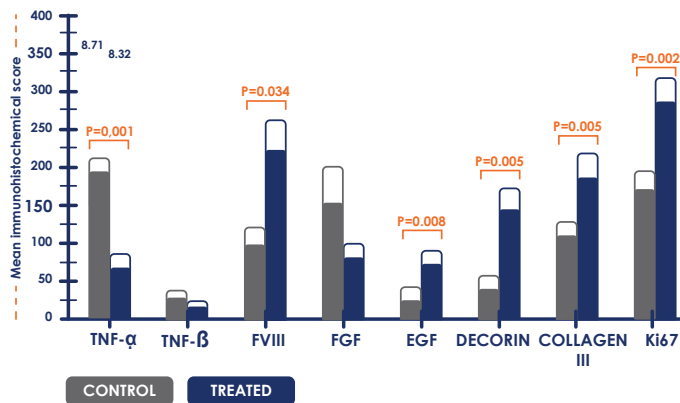
The areas treated with FLE achieved **lower histology scores** ($P=0.001$), consistent with complete re-epithelialization, less inflammation of the dermal layer, high neoangiogenesis and greater and more regular deposition of collagen (Figure 1). Expression of FVIII, EGF, decorin, collagen III and Ki-67 was higher and expression of TNF- α was lower in treated wounds (Figure 2).

FIGURE 1 Histologic appearance of wounds.



(A) portion treated with FLE, (B) untreated portion.
(A1),(B1), Hematoxylin & eosin colouration. Epidermal integrity and basal activity (greater dermic papillary fever) seemed greater in treated wounds (A1). No residual phlogosis and high neoangiogenesis were noted in the treated portion in (A1) when compared with the control sample in (B1).
(A2),(B2), Immunoblotting for (AE1/AE3). Note the strong cytokeratinic expression of the (A2) sample compared with the (B2) sample, which is consistent with epidermal integrity in (A2) compared with a partial re-epithelialization in (B2).
(A3),(B3), Collagen immunograde III. The expression of collagen III in (A3) is abundant compared with that in the (B3) sample.
(A4),(B4), Deposition of collagen is more abundant and regular in (A4), whereas greater phlogosis, blood extravasation and fibrosclerotic processes are present in (B4) (blue tendency to black; Masson's trichrome).

FIGURE 2 Immunohistochemistry scores of treated and control wounds.



CONCLUSION

In this study, the use of Fluorescent Light Energy (FLE) in uncomplicated surgical wounds improved microscopic features and stimulated the release of cytokines associated with skin regeneration.

In the maturation phase, the sites treated with FLE exhibited tissue growth and more complete tissue repair. These histological improvements, orchestrated by several growth factors, should create favourable conditions for the scarring process and may improve the strength of repair tissues.

Such effects could reduce the risk of dehiscence, excessive scar formation, keloids and chronic inflammation. In humans, FLE has shown to be very well tolerated and helpful in the management of acute and chronic wounds and burns.

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