

# 1. Introduction

In the literature, the treatment of facial burns in individuals with darker skin tones is scarce, but the association between the risk of scar formation and darker skin is wellestablished [1]. Studies report that lighter brown, mixed, and Black skin tones have been cited as significant risk factors for poor scar development, with darker skin tones (Fitzpatrick types IV-VI) being predictors of reduced long-term scar quality [2]. When affecting the face, poorly treated burns can lead to sequelae and dysfunctions, making specialized treatment in specific units essential [3]. The face plays a crucial role in social interaction and identity. Alterations in this area can cause excessive concern about appearance, low self-confidence, negative perception by others, and an increase in anxiety, depression, and neglect of health [4].

Low-level laser therapy (LLLT) is an excellent ally in the treatment of burn patients and has garnered interest among healthcare professionals. It is a non-invasive therapy with properties that modulate inflammatory processes, reduce acute and chronic pain, and accelerate tissue repair [5]. LLLT benefits all phases of burn healing (inflammatory, proliferative, and maturation), speeding up tissue repair, reducing the risk of infection,

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# **Effects of Low-Level Laser Therapy in a Black Patient with Facial Burn:** A Case Report

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Abstract: Burns are injuries resulting from exposure to thermal, chemical, or electrical sources, ranging from small blisters to deep lesions that affect the skin, subcutaneous tissues, tendons, muscles, and bones. Although Low-Level Laser Therapy (LLLT) is widely recognized in the literature as an adjunct treatment for burns, its application in Black patients remains limited. This case report describes the treatment of a Black patient with a facial burn using LLLT with infrared laser (4 Joules per point) and red laser (1 Joule per point), both at a power of 100mW. The results demonstrated that LLLT is promising, reducing hospital stay duration, minimizing infections, and improving quality of life. It also provided analgesia, comfort, and accelerated healing. Additionally, the technique contributed to aesthetic and functional rehabilitation, boosting the patient's self-esteem. However, due to the scarcity of studies on this therapy in Black patients, there is a need for robust clinical trials with significant samples to establish irradiation protocols considering burn severity, skin color, age, and burn location.

Keywords: Burns; Low-level laser therapy (LLLT); Wound healing; Black population; Facial injuries.



Case Report



and enhancing phagocytosis of debris, angiogenesis, fibroblastic activity, and reepithelialization with organized collagen. For clinical effects, chromophores such as melanin, hemoglobin, water, and even tattoo ink must be irradiated [6].

The main difference between darker ethnic skin tones (Fitzpatrick phototypes IV to VI) and lighter skin is the greater amount of epidermal melanin in the former. This can convert absorbed energy into heat, leading to side effects such as depigmentation, hyperpigmentation, and scarring. Due to these risks, there is limited literature on the treatment of darker skin tones, requiring greater specialization and clinical experience for conservative and safe treatments [7]. Given the scarcity of scientific literature on this topic, it is crucial to investigate epidemiological studies and treatment protocols to develop prevention and treatment strategies. In this context, the present case report aims to serve as a reference tool and a proposal for effective treatment using low-level laser therapy for facial burns in Black patients, while highlighting the importance of the clinical case, the treatment applied, and the results achieved.

## 2. Case Report

A 22-year-old male patient was admitted to the Burn Treatment Center (BTC) at the Dr. José Frota Institute (IJF) in Ceará, Brazil, with second- and third-degree burns caused by a butane gas explosion. The injuries affected his upper and lower limbs and face, covering 20% of his total body surface area. The patient was stable, afebrile, and showed no visible areas of necrosis, thus not requiring surgical intervention. He was referred for balneotherapy for surgical wound cleaning and dressing, aiming to reduce the risk of infections.

The hospital dentistry team was consulted to initiate treatment for the facial burns using low-level laser therapy (LLLT). The patient presented lesions predominantly on the middle third of the left side of the face, involving the periorbital and left ear regions, retroauricular area, lips, dorsum and apex of the nose, and glabella (Figure 1). The team followed a burn cleaning protocol using 0.9% saline solution and, when necessary, collagenase, before applying LLLT. The patient underwent a thorough evaluation, including their history of sun exposure, Fitzpatrick phototype, medical and surgical history, presence of preexisting scars, keloids, hyperpigmentation or depigmentation due to trauma, ethnic heritage, and prior medications or facial treatments.

After a detailed explanation of the risks and benefits, the patient provided informed consent by signing the Free and Informed Consent Form (FICF). The irradiation protocol included sessions with a red laser (660 nm) applied point-by-point with 1 Joule per point (1 J/P) and an infrared laser (808 nm) applied point-by-point with 4 Joules per point (4 J/P), both with a fixed power of 100 mW, using the MMO DUO semiconductor device [8].

During the second session, the patient reported a burning sensation with the red laser. To address this, the protocol was adjusted to maintain 1 J/P but with two irradiations of 0.5 J at the same point. Following this adjustment, the patient no longer experienced discomfort. Three sessions of LLLT with the infrared laser were performed for analgesic effects. After seven sessions with the red laser, there was significant improvement in the patient's facial burns, with no formation of blisters, hyperpigmentation, or keloids (Figure 2).

The patient was instructed to hydrate the facial skin with Bepantrix or Kollagenase, moisturize the lips with Bepantol, and apply sunscreen with an SPF of 60 or higher. Due to his improvement and considering the distance to his residence and personal commitments, he was discharged by the team, with a follow-up appointment scheduled in one



Figure 1. Photos taken immediately before the 1st session of low-level laser therapy.

**Figure 2**. Photo taken immediately after the 7th session of low-level laser therapy (A) and after the first month (B), using a facial moisturizer. It is possible to observe the treated area (face) with considerable improvement compared to the hand.



# 3. Discussion

In this case report, we describe the treatment of a facial thermal burn in a Black patient using low-level laser therapy (LLLT). Thermal burns are the most common type of burn injury, with the majority of incidents occurring at home [9], and males being the most affected group [10]. Regarding the relationship between hypertrophic (raised) scars and skin color, high-quality evidence is lacking. One study investigated Fitzpatrick skin types and the risk of raised scars after burns, showing that individuals with skin types IV–VI were almost five times more likely to develop hypertrophic scars compared to those with skin types I–III [11]. Additionally, Patient and Observer Scar Assessment Scale (POSES) scores were significantly higher in patients with skin types V–VI compared to those with types I–II and III–IV [12].

Review studies highlight a significant increase in depression and anxiety in patients with facial scars, stemming from concerns about appearance and the associated psychological impact. While these psychopathologies are more common in women, their higher prevalence in men can significantly affect development, underscoring the need for LLLT not only to improve scarring and functional outcomes but also aesthetic results [13]. The pathophysiology of burn healing is distinct from other injuries, being characterized by inflammatory reactions with edema and tissue necrosis [14]. The present case corroborates previous studies showing that LLLT contributes to immediate and long-term burn tissue repair, being especially crucial during the proliferative and repair phases [9]. This contrasts with silver sulfadiazine, which, while safe and effective as a topical antimicrobial agent and the first choice for burn treatment in healthcare institutions, delays reepithelialization and should be discontinued once visible healing is evident [15, 16].

During the inflammatory phase of burn healing, laser irradiation can reduce inflammatory cells, modulate the inflammatory process, increase polymorphonuclear activity against bacteria, promote phagocytosis of tissue debris, and boost reactive oxygen species production, resulting in an antioxidant effect. This supports the production of growth factors that drive subsequent healing phases [17]. In the proliferative phase, LLLT increases fibroblast proliferation and accelerates wound epithelialization. The efficiency of fibroplasia is linked to angiogenesis and blood flow, facilitating even the viability of skin flaps through LLLT [18]. Finally, LLLT is effective in early stimulation of fibroblast transformation into myofibroblasts, aiding wound contraction during healing. This accelerates wound closure by enhancing contraction through myofibroblasts. Studies have shown a 40% reduction in healing time with LLLT. During the remodeling phase, LLLT remains a crucial ally, accelerating wound closure and positively influencing inflammatory and proliferative phases. It also promotes a more organized scarring process, with collagen fibers aligned parallel to the epidermis, contributing to an improved aesthetic outcome due to increased scar tensile strength [19, 20].

## 4. Conclusion

Low-level laser therapy in the management of patients with facial burns is a valuable approach, providing analgesia, comfort, enhanced cell proliferation, increased vascularization, accelerated healing, collagen organization, reduced hospitalization time, and restoration of patients' self-esteem. However, the scarcity of specific clinical evidence, such as the lack of standardization, depth assessment of lesions, and particularly the limited representation of Black patients in the literature, highlights the urgent need for the development of specialized studies and the creation of protocols. These should include rigorous and robust clinical trials, ensuring safe and unbiased results that consider variables such as burn severity, age, sex, skin color, and demographic characteristics of patients.

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**Research Ethics Committee Approval:** We declare that the patient approved the study by signing the informed consent form, and that the study followed the ethical guidelines established by the Declaration of Helsinki.

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