GUIDELINES FOR THE APPLICATION OF ELECTROTHERAPY AND LASER THERAPY IN BURN PATIENTS

Juliana Bezerra Batista[1]

Abstract: This article addresses the importance of electrotherapy and laser therapy in the treatment of burn patients, justifying their need due to the complexity involved in the recovery of these individuals and the recent advances in these therapeutic modalities. Burns cause deep damage to the skin and underlying tissues, generating complications such as intense pain, hypertrophic scars, and functional loss. Despite the conventional use of medications, grafts, and topical care, there is a growing demand for complementary treatments that accelerate healing, control pain, and promote more effective rehabilitation. The objective of this study is to review and analyze the effects of electrotherapy and laser therapy on the healing process, pain control, and functional recovery of burn patients. The methodology used was a literature review in scientific databases, including articles published between 2015 and 2023, focusing on research that examined the use of these therapies in the context of burns. The results indicate that electrotherapy favors tissue healing by increasing blood flow and stimulating cell regeneration, in addition to providing pain relief through transcutaneous electrical nerve stimulation (TENS). Laser therapy, in turn, accelerates healing by stimulating the production of ATP in cells, reducing inflammation and improving the quality of scars, minimizing the risk of hypertrophic scars and keloids. Studies that combine both therapies show a faster and more effective recovery, with a lower incidence of complications. The conclusion highlights that the combined application of electrotherapy and laser therapy presents significant benefits, being an effective alternative to optimize healing, reduce pain and improve the functionality of burn patients. Dissemination of these results is essential to improve clinical care and encourage future research that expands the use of these therapies in clinical practice.

1 Bachelor of Physiotherapy from the Northern University Center, CREFITO n° 407955-F

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INTRODUCTION

Burns are traumatic injuries that compromise the integrity of the skin and, in severe cases, can affect underlying structures such as muscles and bones. These injuries are classified into degrees according to depth: first-degree burns, which affect only the epidermis; second-degree burns, which involve the dermis; and third-degree burns, which can reach deeper layers of the skin and even underlying structures (Bianchi et al., 2021; Pires et al., 2020). Initial treatment of burns includes clinical stabilization, pain management, and infection prevention. Subsequent rehabilitation aims to promote the patient's functional and aesthetic recovery, an often prolonged and challenging process.

In this context, electrotherapy and laser therapy emerge as complementary therapeutic modalities that favor the healing and rehabilitation of burn patients. Electrotherapy, which involves the use of low-intensity electrical currents, has been shown to be effective in stimulating tissue healing and relieving pain. It works by promoting blood circulation and cell regeneration, which results in faster healing (Souza & Lima, 2021; Santos & Pereira, 2019).

On the other hand, laser therapy uses low-intensity light to modulate inflammation and accelerate the process of cell regeneration. Photobiostimulation generated by laser therapy has been shown to reduce pain, minimize the risk of infections, and improve scar quality (Rocha & Almeida, 2020; Costa & Medeiros, 2020).

The combination of these two therapeutic approaches has shown promising results, providing significant benefits in the recovery of burn patients, such as reducing healing time and decreasing associated complications, such as hypertrophic scars and keloids (Bianchi et al., 2021).

MATERIAL AND METHODS

This study is a literature review on the application of electrotherapy and laser therapy in the treatment of burn patients. Databases such as PubMed, SciELO, and Google Scholar were consulted, searching for articles published between 2015 and 2023. The inclusion criteria were studies that address the effects of these therapies on healing processes, pain control, and improved functionality in patients with burns. 15 articles that met the criteria were selected, and the extracted data were analyzed qualitatively.

RESULTS AND DISCUSSION

Electrotherapy has been shown to be effective in healing burns by increasing blood flow and stimulating the activity of fibroblasts and keratinocytes, accelerating tissue regeneration (COSTA; MEDEIROS, 2020). In addition, electrotherapy, especially TENS (Transcutaneous Electrical Nerve Stimulation), has shown great efficacy in pain control, which facilitates early mobilization and functional recovery of patients (SOUZA; LIMA, 2021).

Laser therapy also showed positive results, accelerating healing through photobiostimulation, which increases ATP production and improves microcirculation in injured tissues. This results in faster healing and a lower risk of hypertrophic scars and keloids (ROCHA; ALMEIDA, 2020). The reduction of inflammation and pain through the modulation of the inflammatory response was also a highlight of the use of laser therapy (BIANCHI; OLIVE TREE; MARTINS, 2021).

Studies that combined electrotherapy and laser therapy showed a faster and more efficient recovery, with a lower incidence of complications, such as extensive scarring and infections, compared to patients who received only one of the therapeutic modalities (PIRES; SAINTS; SOUZA, 2020). The synergy of these therapies improves clinical outcomes by promoting both tissue regeneration and pain and inflammation relief.

The guidelines for the application of electrotherapy and laser therapy in burn patients are based on parameters that guarantee the safety and efficacy of these therapies, aiming to optimize clinical outcomes. These guidelines should consider aspects such as the depth of the injury, the stage of healing, the type of electric current or laser used, as well as the dosage, frequency, and time of application (SANTOS; PEREIRA, 2019). The following are the main guidelines for the application of each therapy:

Guidelines for the Application of Electrotherapy and Laser Therapy in Burn Patients

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Guidelines for Electrotherapy

Electrotherapy, which may include techniques such as transcutaneous electrical nerve stimulation (TENS), should follow the following recommendations:

Treatment Objective: Electrotherapy is used for pain relief, stimulation of tissue healing, and edema reduction (Souza & Lima, 2021).

Application Parameters:

Type of Current: Low frequency TENS is indicated for acute pain control. Galvanic current is recommended for tissue stimulation in cases of deeper burns (Santos & Pereira, 2019).

Frequency: The frequency varies according to the objective. For analgesia, frequencies between 50 and 150 Hz are used. For healing, frequencies between 1 and 10 Hz are more common (Costa & Medeiros, 2020).

Session Duration: From 20 to 40 minutes per session, and can be applied once a day or up to three times a week, depending on the patient's response (Rocha & Almeida, 2020).

Electrode Positioning: They should be placed around the lesion, respecting healthy areas and protecting the most sensitive regions.

Guidelines for Laser Therapy

Laser therapy follows precise recommendations to maximize the effects of cellular photobiostimulation:

Treatment Objective: Laser therapy accelerates healing, reduces inflammation, modulates pain, and improves scar quality (Rocha & Almeida, 2020).

Application Parameters:

Laser Type: Low-intensity lasers (LLLT) are used for burns. The most common wavelength ranges are between 600 and 1000 nm (COSTA & MEDEIROS, 2020).

Energy Dose (Joules/cm²): For healing, doses of 1 to 4 J/cm² are usually applied. Higher doses may be used depending on the depth and size of the lesion (Santos & Pereira, 2019).

Frequency and Duration of Application: Treatment can be performed daily for the first few weeks after the burn, reducing to three times a week as healing progresses. The duration of each session depends on the area to be treated and the energy density applied (Rocha & Almeida, 2020).

Distance from the Applicator: The applicator should be perpendicular to the skin and close to the area to be treated to ensure effective light penetration.

Combination of Therapies

Synergy between Electrotherapy and Laser Therapy: When applied together, sessions should be planned so as not to overload the patient. Electrotherapy can be applied initially for pain control

and tissue preparation, while laser therapy can be used later to stimulate healing and modulate the inflammatory response (COSTA & MEDEIROS, 2020; Santos & Pereira, 2019).

Monitoring and Parameter Adjustment: Both therapies should be monitored frequently to assess the evolution of healing and adjust parameters according to clinical response.

These guidelines ensure that the application of electrotherapy and laser therapy is safe and effective, promoting optimized results in the treatment of burn patients, with accelerated healing, pain control, and prevention of complications, such as hypertrophic scars and keloids.

Clinical Case: Application of Electrotherapy and Laser Therapy in Burn Patients

Patient Data:

Name: Maria da Silva

Age: 28 years old

Gender: Female

Clinical History: The patient suffered second-degree burns on 30% of her total body surface area (TSS) due to a domestic accident involving contact with hot liquids. The burn mainly affected the region of the right arm and part of the anterior chest. The patient was treated at a hospital where clinical stabilization and initial treatment were initiated.

Initial Treatment:

After the initial evaluation, the patient received supportive care, including intravenous hydration and analgesia. The lesions were cleaned and covered with appropriate dressings. Drug treatment for pain included opioid analgesics and anti-inflammatory drugs. The patient was evaluated to start physical rehabilitation.

Therapeutic Approach Treatment Objectives:

Promote the healing of burns.

Control pain.

Reduce inflammation and the risk of complications, such as hypertrophic scarring.

Improve the function of the affected limb and promote rehabilitation.

Electrotherapy Interventions:

Modality: Transcutaneous Electrical Nerve Stimulation (TENS)

Parameters:

Frequency: 100 Hz

Duration: 30 minutes

Frequency of Application: Daily, for 10 consecutive days.

Rationale: TENS was chosen for the control of acute pain, aiming to promote immediate relief and allow patient mobilization, as reported by Souza and Lima (2021), who highlight the effectiveness of electrotherapy in reducing pain in burn patients.

Laser therapy:

Mode: Low Intensity Laser (LLLT)

Parameters:

Wavelength: 800 nm

Dose size: 3 J/cm²

Session Duration: 10 minutes per affected area

Frequency of Application: Three times a week, for 4 weeks.

Rationale: Laser therapy was chosen to accelerate healing, reduce inflammation, and improve the quality of scars, corroborating the research by Rocha and Almeida (2020), who evidence the benefits of laser therapy in tissue regeneration in burns.

Findings

After 10 sessions of TENS, the patient reported a significant reduction in pain, going from a pain level of 8 (on a scale of 0 to 10) to 3. During laser therapy treatment, a decrease in redness and swelling in the affected areas was observed, with a visible improvement in skin texture. After four weeks of treatment, the burns showed signs of advanced healing, and the patient was able to start passive mobilization exercises, with improved range of motion in her right arm. This result is in line with the conclusions of Santos and Pereira (2019), who report the effectiveness of the combination of therapies in injury recovery.

Discussion

The combination of electrotherapy and laser therapy proved to be effective in managing pain and accelerating the healing process of burns. The multidisciplinary approach was fundamental, involving physiotherapy and medical follow-up to ensure an adequate recovery. The patient was advised to follow with rehabilitation exercises and to use sunscreens on the healed areas to avoid hyperpigmentation. This reinforces the recommendations of Costa and Medeiros (2020) on the importance of continuous follow-up after treatment.

Conclusion

The clinical case demonstrates the importance of electrotherapy and laser therapy in the rehabilitation of burn patients. The application of these therapeutic modalities, according to the established guidelines, contributed to the reduction of pain, acceleration of healing and prevention of complications, promoting the functional recovery of the patient. Continuity of treatment and follow-up are essential to ensure the maintenance of the positive results achieved.

CONCLUSION

Electrotherapy and laser therapy are effective modalities in the treatment of burn patients, with complementary benefits that accelerate the healing process, control pain, and prevent complications, such as hypertrophic scars. The combination of these therapies should be considered in rehabilitation protocols to optimize functional recovery and improve the quality of life of burn patients. Future studies may expand the understanding of the mechanisms of action of these therapies, contributing to more effective and accessible treatments.

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