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HOME-BASED CLINICAL EVOLUTION OF A SECOND-DEGREE THERMAL BURN DURING TOPICAL USE OF OZONISED OIL: A CASE REPORT

EVOLUÇÃO CLÍNICA DOMICILIAR DE QUEIMADURA TÉRMICA DE SEGUNDO GRAU COM USO DE ÓLEO OZONIZADO: RELATO DE CASO

EVOLUCIÓN CLÍNICA DOMICILIARIA DE QUEMADURA TÉRMICA DE SEGUNDO GRADO DURANTE EL USO TÓPICO DE ACEITE OZONIZADO: REPORTE DE CASO

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Pages: 1-22

Abstract

Thermal burns may progress with intense pain, secondary infection, and delayed wound healing. This study aimed to describe the clinical evolution observed during home follow-up of a second-degree thermal burn subjected to topical use of ozonised oil. This is an observational case report developed in 2023 and linked to a project approved by the Research Ethics Committee of the Pará State University. The patient, a 41-year-old male, sustained a thermal burn following an occupational accident involving boiling liquid, affecting the anterolateral hemithorax, right arm, and cervical region. Following initial treatment at an emergency care unit, with conventional topical prescription, the patient voluntarily opted for the exclusive home use of ozonised oil during clinical follow-up. Management included local cleansing and topical application of the product three times daily, with clinical monitoring and serial photographic records over eleven consecutive days. During follow-up, progressive reduction of hyperaemia, advancement of re-epithelialisation, and absence of apparent clinical signs of secondary infection were observed. By the eleventh day, the lesion showed almost complete re-epithelialisation of the affected surface. The clinical findings observed during follow-up demonstrated satisfactory lesion evolution throughout the analysed period and reinforce the relevance of further clinical investigations regarding the topical use of ozonised oil in thermal burns.
Keywords: Burns; Ozone Therapy; Wound Healing; Complementary Therapies.

Resumo

As queimaduras térmicas podem evoluir com dor intensa, infecção secundária e atraso na cicatrização. Este estudo teve como objetivo descrever a evolução clínica observada durante acompanhamento domiciliar de queimadura térmica de segundo grau submetida ao uso tópico de óleo ozonizado. Trata-se de relato de caso observacional, desenvolvido em 2023, vinculado a projeto aprovado pelo Comitê de Ética em Pesquisa da Universidade do Estado do Pará. Ao paciente, sexo masculino, 41 anos, sofreu queimadura térmica após acidente ocupacional envolvendo líquido fervente, acometendo hemitórax anterolateral, braço direito e região cervical. Após atendimento inicial em unidade de urgência, com prescrição tópica convencional, o paciente optou voluntariamente pelo uso domiciliar exclusivo de óleo ozonizado durante o acompanhamento clínico. O manejo incluiu higienização local e aplicação tópica do produto três vezes ao dia, com acompanhamento clínico e registros fotográficos seriados durante onze dias consecutivos. Ao longo do seguimento observou-se redução progressiva da hiperemia, avanço da reepitelização e ausência de sinais clínicos aparentes de infecção secundária. No décimo primeiro dia, a lesão apresentava reepitelização quase completa da superfície acometida. Os achados clínicos observados durante o acompanhamento demonstram evolução satisfatória da lesão no período analisado e reforçam a importância de novos estudos clínicos sobre o uso tópico de óleo ozonizado em queimaduras térmicas.

REMUNOM
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Pages: 1-22

Palavras-chave: Queimaduras; Ozonioterapia; Cicatrização; Terapias Complementares.

Resumen

Las quemaduras térmicas pueden evolucionar con dolor intenso, infección secundaria y retraso en la cicatrización. El presente estudio tuvo como objetivo describir la evolución clínica observada durante el seguimiento domiciliario de una quemadura térmica de segundo grado sometida al uso tópico de aceite ozonizado. Se trata de un reporte de caso observacional desarrollado en 2023, vinculado a un proyecto aprobado por el Comité de Ética en Investigación de la Universidad del Estado de Pará. El paciente, de sexo masculino y 41 años de edad, sufrió una quemadura térmica tras un accidente laboral con líquido hirviendo, comprometiendo el hemitórax anterolateral, el brazo derecho y la región cervical. Después de la atención inicial en una unidad de urgencias, con prescripción tópica convencional, el paciente optó voluntariamente por el uso domiciliario exclusivo de aceite ozonizado durante el seguimiento clínico. El manejo incluyó higiene local y aplicación tópica del producto tres veces al día, con seguimiento clínico y registros fotográficos seriados durante once días consecutivos. Durante el seguimiento se observó reducción progresiva de la hiperemia, avance de la reepitelización y ausencia de signos clínicos aparentes de infección secundaria. Al undécimo día, la lesión presentaba reepitelización casi completa de la superficie afectada. Los hallazgos clínicos observados durante el seguimiento demuestran evolución satisfactoria de la lesión en el período analizado y refuerzan la importancia de nuevos estudios clínicos sobre el uso tópico de aceite ozonizado en quemaduras térmicas.

Palabras clave: Quemaduras; Ozonoterapia; Cicatrización; Terapias Complementarias.

1. Introduction

Thermal burns remain an important public health issue because of their high incidence and the physical, emotional, and functional consequences associated with these injuries (Anjali; Kumar, 2025). According to the World Health Organization, burns are among the leading causes of traumatic morbidity worldwide, particularly in populations exposed to greater domestic, occupational, and social vulnerability (WHO, 2018). The clinical repercussions vary according to the depth and extent of the injury and may include severe pain, increased susceptibility to infection, functional impairment, and permanent damage to skin integrity (Bakshi, 2024).

REMUNOM
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Pages: 1-22

Among burn-related injuries, thermal burns are especially frequent in domestic and occupational settings involving overheated liquids, flames, or heated surfaces. Epidemiological evidence indicates that occupational burn injuries remain common among workers exposed to industrial heat sources and heated liquids, particularly in operational and mechanical activities (Toolaroud et al., 2023). Second-degree burns are characterised by involvement of the epidermis and partial damage to the dermis, usually accompanied by hyperaemia, blister formation, and areas of de-epithelialisation (Perkins et al., 2022).

Beyond the initial tissue damage caused by thermal trauma, the inflammatory response triggered after the injury may interfere with tissue repair and contribute to delayed healing and increased vulnerability to microbial colonisation. Consequently, burn management aims not only to control pain and prevent secondary infection, but also to preserve local conditions favourable to tissue regeneration and ensure continuous nursing care throughout the healing process (Ponciano et al., 2024; Żwierełło et al., 2023).

In recent years, complementary topical approaches have been investigated as possible adjuncts in wound management. Among these, ozonised oil has attracted attention because of its reported antimicrobial properties and its potential interaction with inflammatory processes involved in tissue repair (Ugazio et al., 2020; Spadea et al., 2021).

Although experimental and observational studies have described potentially favourable findings related to ozonised products, the available clinical evidence involving human burns remains limited, particularly due to the small number of controlled clinical studies currently available (Adler et al., 2025; Simplício et al., 2025).

In this context, the present study aimed to describe the clinical evolution observed during home-based follow-up of a second-degree thermal burn treated with topical ozonised oil, while discussing the interpretative limitations inherent to the observational design of a single clinical case.

2. Literature Review

REMUNOM
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Pages: 1-22

Thermal burns remain among the most common traumatic injuries encountered in clinical practice, particularly in domestic and occupational settings. Depending on the depth and extent of the affected area, these injuries may progress with severe pain, risk of infection, delayed healing, and permanent scar formation. In more extensive cases, burns may also trigger systemic inflammatory responses and important metabolic alterations, making clinical management a significant therapeutic challenge (Burgess et al., 2022).

Second-degree burns involve damage to the epidermis and partial involvement of the dermis, usually associated with hyperaemia, blister formation, exudation, and marked pain sensitivity (Perkins et al., 2022). Recent guidelines further emphasise that second-degree burns require continuous assessment of wound depth, infection control, and therapeutic strategies aimed at preserving dermal viability and promoting early re-epithelialisation (Shizhao Ji et al., 2024). The clinical evolution of these lesions depends on factors such as burn depth, total body surface area involved, microbial contamination, patient clinical condition, and the treatment provided.

The wound-healing process involves a complex sequence of cellular and biochemical events. Initially, there is activation of the local inflammatory response, recruitment of neutrophils and macrophages, and release of inflammatory mediators and reactive oxygen species. This phase is followed by cellular proliferation, angiogenesis, granulation tissue formation, and progressive re-epithelialisation of the injured area (Burgess et al., 2022).

Although inflammation is essential for initiating tissue repair, excessive or prolonged inflammatory activity may contribute to oxidative damage and impair skin regeneration. For this reason, therapeutic approaches capable of controlling microbial proliferation while preserving cellular viability have attracted increasing interest in burn management (Yassaghi et al., 2024). In addition, recent biomedical approaches involving transdermal delivery systems for growth factors have shown potential in accelerating skin regeneration and tissue repair in thermal burns (He et al., 2024).

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Pages: 1-22

Silver sulfadiazine remains one of the topical agents most widely used in burn care because of its broad-spectrum antimicrobial activity. However, some studies suggest that prolonged use may interfere with keratinocyte and fibroblast activity, potentially delaying re-epithelialisation under certain clinical conditions (Damasceno et al., 2023). This has encouraged the investigation of complementary approaches aimed at balancing infection control and tissue repair.

Within this context, ozonised oil has been investigated as a possible topical therapeutic alternative. The product is obtained by incorporating medical ozone into unsaturated vegetable oils, leading to the formation of relatively stable oxidative compounds, including ozonides and lipid hydroperoxides (Ugazio et al., 2020). Additional studies suggest that ozonised derivatives may interact with cellular mechanisms related to redox balance, inflammatory modulation, and tissue repair, increasing clinical interest in these topical formulations (Izzotti et al., 2022). These compounds also demonstrate antimicrobial activity and may influence the wound microenvironment.

Experimental studies have demonstrated antimicrobial activity of ozonised products against bacteria, fungi, and other microorganisms through oxidation of microbial cell membrane components. Some investigations also suggest a possible role in modulation of the inflammatory response and indirect stimulation of granulation tissue formation and angiogenesis (Spadea et al., 2021; Ugazio et al., 2020).

Favourable findings have additionally been reported in experimental burn models, including reduction of inflammatory activity and improvement in tissue regeneration following the use of ozonised compounds (Gao et al., 2023; Ebrahimpour et al., 2020). Nevertheless, most currently available evidence remains concentrated in laboratory, experimental, or observational studies, frequently characterised by small sample sizes and lack of methodological standardisation.

Another important consideration is that second-degree burns possess an intrinsic potential for spontaneous healing, which makes it difficult to establish a direct causal relationship between the intervention applied and the observed clinical outcome. Furthermore, there is still no consensus regarding the ideal ozone

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Pages: 1-22

concentration, frequency of application, duration of treatment, or the most appropriate ozonised oil formulation.

Therefore, although topical ozonised oil presents biological plausibility and encouraging preliminary findings, the currently available clinical evidence remains insufficient for definitive conclusions. In this context, detailed clinical reports should be interpreted as exploratory records capable of supporting the formulation of therapeutic hypotheses for future controlled studies, rather than as confirmation of clinical efficacy.

3. Methodology

3.1 Study design

This is an observational, descriptive, and longitudinal clinical case report developed during the second semester of 2023, involving home-based follow-up of a patient affected by a second-degree thermal burn. The construction of the report followed, where applicable, the recommendations of the CARE Guideline for clinical case reports, aiming to provide greater methodological transparency regarding the description of the case, the intervention performed, and the clinical evolution observed.

3.2 Ethical aspects

The study is part of a project approved by the Research Ethics Committee of the Pará State University under opinion number 4.459.850 and CAAE number 35614920.0.0000.5168. The patient received information regarding the objectives of the study, confidentiality of the information, and academic use of the clinical images. Following agreement, the participant signed an Informed Consent Form authorising participation in the study and scientific dissemination of the clinical case, with preservation of identity.

3.3 Clinical characterisation of the patient

The patient was a 41-year-old male mechanic with no reported history of

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Pages: 1-22

diabetes mellitus, immunosuppression, or previously documented dermatological diseases. The burn occurred in an occupational setting following accidental contact with boiling liquid, affecting the anterolateral hemithorax, right arm, and cervical region.

The extent of the injured area was estimated at approximately 11%–12% of the total body surface area using proportional clinical assessment based on the Rule of Nines for adults, considering the anatomical distribution of the affected regions.

Initial assessment revealed areas of intense hyperaemia, ruptured blisters, significant pain, mild serous exudation, and areas of de-epithelialisation compatible with a second-degree burn. Classification of burn depth was performed clinically by a qualified professional during the initial assessment, considering the presence of preserved pain sensation, hyperaemia, surface moisture of the affected area, ruptured blisters, and partial dermal involvement, without clinical signs suggestive of deep burns, carbonisation, or extensive tissue necrosis.

No clinical signs suggestive of secondary infection were identified during the initial evaluation, including purulent secretion, tissue necrosis, foul odour, or adjacent cellulitis. Although the cervical region was affected, no clinical signs of respiratory impairment, significant functional restriction of cervical movements, major mobility limitation, or immediate need for specialised surgical intervention were observed during the initial assessment.

3.4 Initial management and therapeutic decision

Initial treatment was provided at an Emergency Care Unit linked to the Brazilian Unified Health System in the municipality of Santarém, Pará. At that time, 2% silver sulfadiazine associated with oral anti-inflammatory medication for symptomatic control was prescribed.

Following the initial clinical assessment, the patient was haemodynamically stable, with no apparent clinical signs of systemic involvement, inhalation injury, secondary infection, or functional deterioration related to the affected cervical region. Considering the clinical stability presented, the absence of immediate criteria

REMUNOM
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Vol: 13.10
DOI: 10.66104/3z1qyz91
Pages: 1-22

for hospital admission, and the possibility of continuous follow-up assessment, the case was managed in a home environment with serial monitoring of the lesion.

During the initial contact for home-based follow-up, the patient informed the research team that he had previous knowledge regarding the topical use of ozonised oil in skin lesions and expressed personal interest in using the product during local burn care. According to his report, the choice was related to ease of home application and the subjective perception of greater comfort during lesion management.

Therefore, the patient voluntarily opted for exclusive topical use of ozonised oil and did not use the silver sulfadiazine initially prescribed. The decision was autonomous and did not correspond to a formal recommendation for therapeutic substitution by either the research team or the professionals responsible for emergency care.

Throughout the follow-up period, the patient remained instructed regarding the need for continuous clinical monitoring and immediate return to health services in the presence of fever, worsening pain, purulent secretion, foul odour, expansion of hyperaemia, cervical functional limitation, respiratory difficulty, or any signs suggestive of clinical deterioration of the lesion.

Thus, the therapeutic choice described in this report should be interpreted as an individual decision observed within a specific clinical context, and not as a generalisable recommendation for replacement of conventional therapy in second-degree burns.

3.5 Topical application protocol

Home management initially consisted of local cleansing with running water at room temperature, followed by careful drying using a clean and dry cloth. Subsequently, the ozonised oil was applied directly over the entire injured area using a dropper, ensuring uniform coverage of the affected skin surface. Application was performed three times daily at approximately eight-hour intervals throughout the entire clinical follow-up period. No other topical healing agents, local

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Pages: 1-22

antimicrobials, special dressings, or occlusive coverings were used during the observed period. The patient was instructed to observe daily for possible signs of clinical deterioration, including fever, increased pain, purulent secretion, unpleasant odour, expansion of hyperaemia, or development of necrotic areas.

3.6 Production, storage, and characterisation of the ozonised oil

The ozonised oil was produced from DERSANI® sunflower oil subjected to ozonisation using the corona discharge technique. Medical ozone was generated from medical oxygen using OzonLife Medical Systems equipment, Brazil, connected to an oxygen cylinder through silicone tubing coupled to a stainless-steel diffuser. The system allowed continuous gas infusion into 500 ml of sunflower oil, reaching a concentration of 50 mg/L under continuous flow of ⅛ L/min (Simplício et al., 2025).

The ozonisation procedure occurred through continuous exposure of the oil to the gaseous flow under controlled bubbling in a glass container suitable for ozonisation. Total ozone exposure time was 8 hours.

After preparation, the ozonised oil was stored in an amber container, protected from light and kept under refrigeration until use. The interval between product preparation and initiation of topical application was approximately 30 days.

During storage and handling, basic contamination-reduction measures were adopted, including the use of a clean container, adequate sealing of the bottle, and minimisation of prolonged exposure to heat, light, and direct environmental contact.

The product used in this report was prepared specifically for observational use within the context of the clinical follow-up described and was not subjected to additional laboratory physicochemical characterisation procedures after the storage period.

No complementary tests related to peroxide index, oxidative stability, viscosity, acidity, microbiological sterility, or laboratory quantification of ozonised derivatives present in the oil after preparation and storage were performed.

Therefore, the nominal gas concentration used during the ozonisation process should not be interpreted as an equivalent measure of the final chemical characterisation of the topically applied product, since factors related to exposure

REMUNOM
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Pages: 1-22

time, storage conditions, and oxidative stability may influence the final composition of the ozonised oil.

Although basic preservation and contamination-reduction measures were adopted during storage and handling of the product, no specific laboratory tests regarding stability or microbiological control were performed after the storage period, constituting a relevant methodological limitation for reproducibility of the preparation used in this report.

3.7 Clinical follow-up and photographic documentation

Clinical follow-up was conducted over eleven consecutive days in a home environment, with remote monitoring of burn evolution through serial photographic records and periodic communication between the patient and the research team. The images were produced by the patient using a personal mobile phone after prior guidance to record the same anatomical region, in a similar position, with adequate exposure of the injured area and, preferably, before application of the ozonised oil.

Evolution assessment was conducted based on the photographic records and clinical information reported by the patient. The analysis considered criteria related to intensity of hyperaemia, presence of visible exudate, skin integrity, persistence or rupture of blisters, visual reduction of the raw area, progression of re-epithelialisation, and apparent clinical signs of secondary infection, such as purulent secretion, necrosis, expansion of peripheral hyperaemia, or worsening of the local inflammatory appearance.

In addition to descriptive assessment, semiquantitative analysis of clinical evolution was performed, considering visual estimation of re-epithelialisation progression, intensity of hyperaemia, presence or absence of apparent exudate, reports of pain throughout follow-up, need for additional analgesia, and occurrence of functional limitation during the observed period.

Hyperaemia was classified as intense, moderate, mild, or absent according to the visual extent of erythema over the affected surface. Progression of re-epithelialisation was comparatively estimated based on visual reduction of the de-epithelialised areas observed in the serial photographic records.

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Pages: 1-22

Throughout follow-up, the patient was instructed to report clinical intercurrences, including fever, worsening pain, foul odour, bleeding, secretion, or any perceived alteration suggestive of lesion aggravation. Evolution assessment was conducted based on the photographic records and clinical information reported by the patient.

Progressive reduction in reported pain was observed, without the need for additional analgesic escalation during the observed period. No local or systemic adverse events associated with topical use of ozonised oil were reported during follow-up, nor was there any need to interrupt home-based follow-up because of clinical deterioration of the lesion. The patient maintained adherence to the proposed remote follow-up throughout the entire observed period, regularly providing the photographic records and clinical information requested by the research team. There were also no reports of persistent functional limitation during home-based follow-up.

However, no planimetric instruments, validated wound-healing scales, objective measurement of the re-epithelialised area, or standardised pain scales were used, constituting a relevant methodological limitation of the present report. Thus, photographic documentation was used as a complementary descriptive resource rather than as a quantitative instrument for objective measurement of wound-healing rate.

3.8 Clinical timeline of the case

To improve descriptive transparency of the clinical report, the chronological sequence of the main events related to the thermal injury, initial management, home-based follow-up, and observed clinical evolution was organised according to the recommendations of the CARE Guideline for case reports (GAGNIER et al., 2014), as presented in Table 1. The timeline was structured to facilitate sequential understanding of the clinical course and to provide greater methodological clarity regarding the therapeutic management and observational follow-up conducted throughout the study period.

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Pages: 1-22

Table 1: Clinical timeline of the case

Period	Clinical event
Day 0	Occupational accident involving contact with boiling liquid, initial treatment at an Emergency Care Unit, clinical assessment of a second-degree burn involving the anterolateral hemithorax, right arm, and cervical region, with prescription of 2% silver sulfadiazine associated with oral anti-inflammatory medication.
Day 1	Beginning of home-based follow-up and the patient's voluntary decision to use exclusive topical ozonised oil, associated with local cleansing and topical application three times daily.
Day 3	Observational reduction of hyperaemia and absence of apparent clinical signs of infectious worsening.
Day 5	Visual reduction of raw areas and progressive improvement in the local inflammatory appearance.
Day 7	Observational progression of re-epithelialisation and reduction in reported pain.
Day 9	Advanced re-epithelialisation of the affected surface.
Day 11	Near-complete re-epithelialisation of the affected surface, absence of apparent clinical signs of secondary infection, and conclusion of home-based follow-up.

Source: Research data (2023)

The clinical timeline allowed sequential organisation of the main events related to patient follow-up, contributing to greater methodological clarity and improved understanding of the evolution observed throughout the home-based follow-up period.

4. Results and Discussion

During clinical follow-up, progressively favourable evolution of the skin lesion was observed. In the initial assessments, extensive areas of hyperaemia, ruptured

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Pages: 1-22

blisters, de-epithelialisation, and dermal exposure compatible with second-degree thermal burns were evident. Over the subsequent days, gradual reduction of the local inflammatory process, visual decrease of the raw areas, and progressive re-epithelialisation of the affected surface were observed.

Serial observational assessment demonstrated progressive reduction of hyperaemia, visual reduction of raw areas, and gradual advancement of re-epithelialisation throughout the eleven days of home-based follow-up. Re-epithelialisation progression was estimated from less than 10% on the first day to near-complete re-epithelialisation by Day 11, according to comparative analysis of the serial photographic records. The main observational clinical parameters monitored during follow-up are presented in Table 2.

Table 2: Serial observational clinical evolution of the second-degree thermal burn during home-based follow-up

Day	Hyperaemia	Estimated re-epithelialisation	Visible exudate	Reported pain	Functional limitation	Infectious signs
D1	Intense	<10%	Mild	Intense	Present	Absent
D3	Moderate	~30%	Mild	Moderate	Mild	Absent
D5	Mild	~50%	Absent	Mild	Absent	Absent
D7	Mild	~75%	Absent	Mild	Absent	Absent
D9	Minimal	~90%	Absent	Mild	Absent	Absent
D11	Absent	>90%	Absent	Absent	Absent	Absent

Source: Research data (2023)

Progressive reduction in reported pain was also observed throughout follow-up, without the need for analgesic escalation. There were no reports of persistent functional limitation, purulent secretion, foul odour, or apparent clinical signs of infectious worsening during the observed period.

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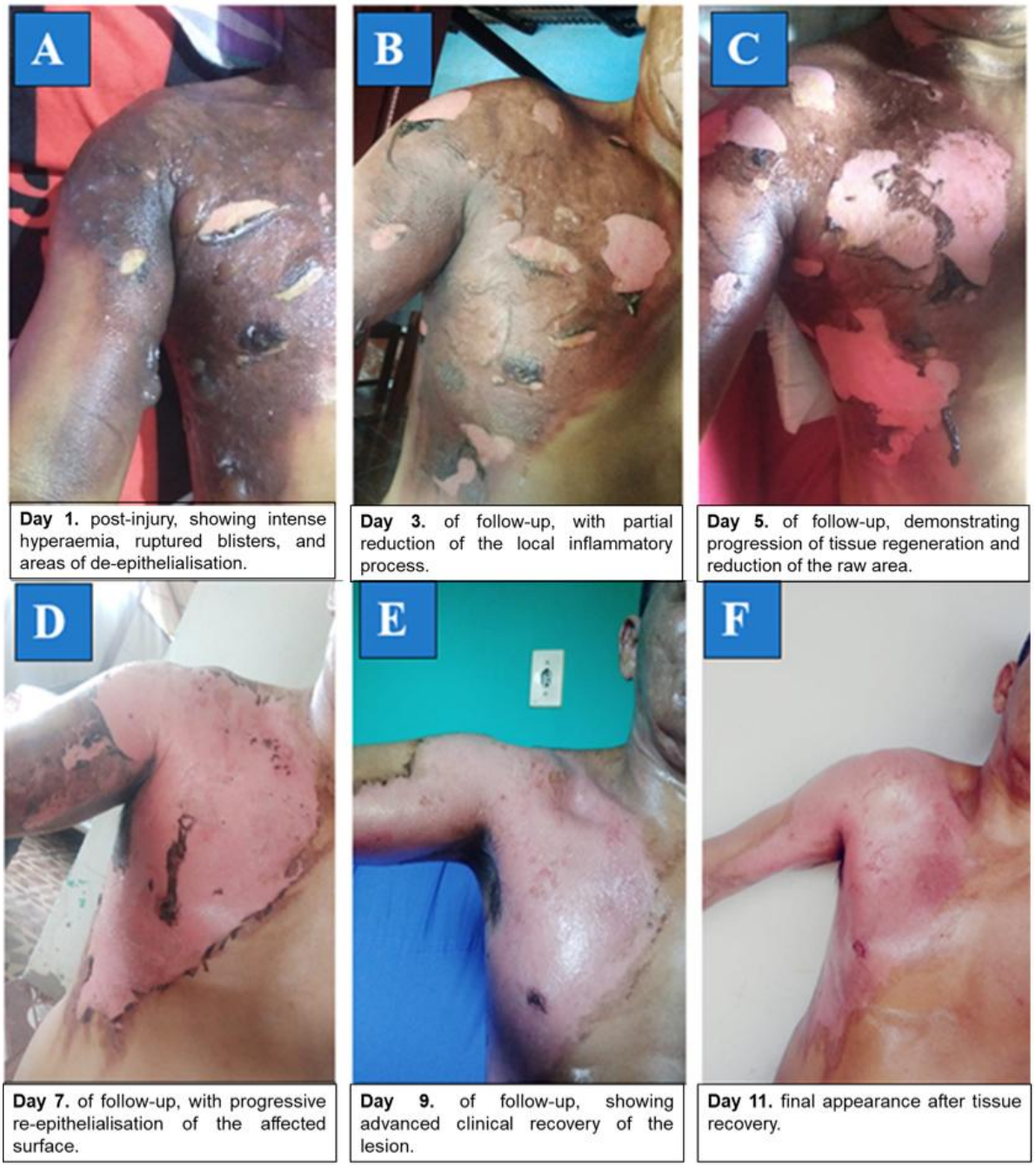
The clinical evolution observed during follow-up may also be visualised in Figure 1, which demonstrates progressive reduction of hyperaemia, improvement in lesion appearance, and gradual re-epithelialisation of the affected surface throughout the evaluation period.

Figure 1: Serial clinical evolution of the second-degree thermal burn during eleven consecutive days of home-based follow-up



Source: Photographic records authorised by the participant (2023).

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Pages: 1-22

By the eleventh day of home-based follow-up, near-complete re-epithelialisation of the affected surface was observed, without apparent clinical signs of secondary infection. Although second-degree burns may undergo spontaneous healing within a variable period ranging from 10 to 21 days, the evolution observed in this report should be interpreted as compatible with favourable clinical recovery during topical use of ozonised oil, without permitting direct causal inference regarding clinical benefit of the product.

This pattern of evolution is consistent with recent consensus statements regarding second-degree burns, which describe variability in re-epithelialisation time according to burn depth, extent of body surface involvement, local inflammatory response, and conditions related to initial clinical management (Ji et al., 2024).

The observed evolution should be analysed in light of the natural history of second-degree burns. This type of lesion may undergo spontaneous re-epithelialisation when partial preservation of the dermis is maintained, local hygiene is adequate, secondary infection is absent, and favourable conditions for tissue repair are preserved. Therefore, reduction of hyperaemia, absence of purulent secretion, and near-complete re-epithelialisation by Day 11 should not be interpreted in isolation as evidence of a specific therapeutic effect of ozonised oil.

Individual variability in wound healing, actual lesion extent, initial burn depth, local moisture control, absence of relevant comorbidities, and serial follow-up may all have contributed to the favourable clinical evolution. Consequently, the present case documents a temporal association between topical use of ozonised oil and satisfactory wound-healing progression, but does not allow distinction between a possible intervention effect and the expected evolution of appropriately monitored burns.

This interpretative caution is particularly important in case reports involving complementary therapies, in which the temporal sequence between intervention and clinical improvement may lead to therapeutic overestimation. Thus, the main contribution of the present study lies in structured clinical documentation and generation of an investigative hypothesis rather than demonstration of clinical efficacy.

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Pages: 1-22

In addition to the progressive regression of inflammatory signs, preservation of lesion bed integrity was observed throughout follow-up, without apparent formation of purulent exudate, necrotic areas, or secondary tissue deterioration.

Another relevant aspect concerns the anatomical location and extent of the burn observed in this report. Lesions involving the trunk, upper limbs, and cervical region frequently require careful evaluation regarding functional risk, need for specialised follow-up, and possibility of clinical deterioration, particularly considering the potential compromise of cervical mobility and skin integrity in areas subject to greater exposure and movement.

In the present case, despite the relatively extensive body surface involvement, no apparent clinical signs of respiratory impairment, major cervical functional restriction, or immediate criteria indicating need for hospital admission were observed during the initial assessment. Nevertheless, home-based management required continuous evolutionary monitoring and formal guidance regarding warning signs requiring immediate medical reassessment.

The literature describes that ozonised compounds may present antimicrobial activity under experimental conditions, particularly because of the formation of oxidative derivatives capable of acting on microbial cell membranes (Ugazio et al., 2020; Sarda; Hingway, 2024). In burns, this topic has attracted clinical interest because bacterial colonisation constitutes an important factor related to delayed wound healing and inflammatory progression of lesions.

In the present report, however, clinical evaluation was limited to observational assessment of lesion evolution, and no microbiological examinations, surface cultures, swab collection, bacterial load analysis, or laboratory methods capable of objectively evaluating microbial colonisation or antimicrobial activity related to the use of ozonised oil were performed.

Thus, the absence of purulent secretion, foul odour, necrosis, or apparent clinical signs of secondary infection should be interpreted exclusively as an observational clinical finding during patient follow-up and does not permit objective inference regarding microbiological reduction of the lesion.

Accordingly, although biological plausibility has been described in

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Pages: 1-22

experimental studies, any interpretation related to a possible antimicrobial effect of ozonised oil in this case remains hypothetical and unsupported by the design employed.

Experimental studies suggest that ozonised compounds may act on mechanisms related to inflammatory response, oxidative balance, and tissue repair (Gao et al., 2023; Spadea et al., 2021). However, the clinical evidence currently available in human burns remains limited, heterogeneous, and predominantly based on observational studies and case reports. Therefore, although biological plausibility has been described in the literature, the findings observed in this study should be interpreted exclusively as clinical evolution occurring during topical use of ozonised oil, without objective confirmation of its mechanisms of action or demonstration of causal therapeutic benefit.

Although semiquantitative observational analysis of clinical evolution was performed, including visual estimation of re-epithelialisation, intensity of hyperaemia, and presence of apparent exudate, the study did not employ validated wound-healing measurement instruments, digital planimetry, standardised pain scales, or objective quantitative methods of tissue repair assessment. Therefore, interpretation of lesion evolution remains predominantly descriptive and subject to the inherent subjectivity of observational clinical evaluation.

Another aspect deserving discussion concerns the therapeutic choice made by the patient. Despite the initial prescription of silver sulfadiazine during emergency care, exclusive use of ozonised oil was adopted during home-based follow-up. This information has important methodological relevance because it reduces interference related to simultaneous use of different topical agents.

During the initial contact for home-based follow-up, the patient informed the research team that he had previous knowledge regarding topical use of ozonised oil in skin lesions and expressed personal interest in using the product during local burn care. According to his report, the choice was related to ease of home application and subjective perception of greater comfort during lesion management.

Thus, the patient voluntarily opted for exclusive topical use of ozonised oil and did not use the silver sulfadiazine initially prescribed. The decision was

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autonomous and did not correspond to a formal recommendation for therapeutic substitution by either the research team or the professionals responsible for emergency care.

Furthermore, the literature currently available regarding ozonised oil in human burns remains limited and heterogeneous. Most publications involve experimental studies, small clinical series, or observational reports, frequently lacking standardisation regarding concentration used, frequency of application, and characteristics of the lesions treated (Ebrahimpour et al., 2020; Ugazio et al., 2020).

Even considering these limitations, the present case retains clinical relevance because it longitudinally documents the evolution of a second-degree thermal burn monitored during home-based topical use of ozonised oil. Serial photographic documentation allowed visual monitoring of re-epithelialisation progression and absence of apparent infectious worsening throughout the observed period.

The present study presents limitations inherent to the observational design of a single case. Clinical assessment was based predominantly on descriptive observation, serial photographic records, and information reported by the patient, without use of planimetric instruments, validated wound-healing scales, or objective quantitative methods of tissue repair assessment.

Furthermore, no microbiological examinations, surface cultures, lesion swabs, or quantitative bacterial load assessment methods were performed, preventing objective inference regarding possible antimicrobial activity related to topical use of ozonised oil. Therefore, the findings should be interpreted with caution, considering the subjectivity inherent to observational assessment and the absence of a clinical comparator.

5. Conclusion

The present report described the clinical evolution of a second-degree thermal burn monitored in a home environment during topical use of ozonised oil, with progressive reduction of hyperaemia, near-complete re-epithelialisation by the

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eleventh day, and absence of apparent clinical signs of secondary infection throughout the evaluated period.

However, due to the observational design of a single case, the absence of a comparator group, the lack of microbiological assessment, the absence of objective wound-healing measurement, and the lack of late follow-up, the findings do not allow establishment of a causal relationship between the use of ozonised oil and the clinical evolution observed.

Therefore, the present report should be interpreted as observational clinical documentation of a favourable evolution occurring during home-based topical use of ozonised oil, without permitting causal inference, therapeutic validation, or generalised clinical recommendation for the management of second-degree burns.

Prospective controlled studies involving microbiological assessment, objective wound-healing measurement, late follow-up, and physicochemical standardisation of the products used are necessary to investigate more robustly the safety and possible clinical applicability of ozonised oil in thermal skin injuries.

Originality Statement

The authors declare that the present manuscript describes a clinical case distinct from that presented in a previous publication involving ozonised oil in burns, with no duplication of patient, clinical images, or previously published results.

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