REVIEW ARTICLE

REVISTA ENFERMAGEM ATUAL IN DERME

NEGATIVE PRESSURE WOUND THERAPY FOR CHRONIC WOUNDS: AN INTEGRATIVE REVIEW

TRATAMIENTO DE HERIDAS CRÓNICAS POR PRESIÓN NEGATIVA: REVISIÓN INTEGRATIVA

TRATAMENTO DE FERIDAS CRÔNICAS POR PRESSÃO NEGATIVA: REVISÃO INTEGRATIVA

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ABSTRACT
Introduction: The skin, the largest organ of the human body, plays an essential role as a protective barrier against the external environment. Any disruption to its integrity is considered a wound. Negative pressure therapy is a significant adjuvant method in wound treatment, with the primary aim of accelerating the repair process and preparing the wound bed for its definitive coverage through various tissue reconstruction techniques. **Aim:** To identify scientific evidence related to the treatment of chronic wounds with negative pressure therapy. **Methods**: This is an integrative review conducted in the Virtual Health Library, CAPES journal portal, SciELO, and PubMed, using the controlled descriptors "Bandages," "Wounds and Injuries," and "Negative-Pressure Wound Therapy." The inclusion criteria were articles in Portuguese, English, and Spanish, available in full, produced between 2017 and 2022, and addressing the guiding question: What is the scientific evidence on the use of negative pressure in chronic wounds? **Results:** Nine studies were selected, published between 2018 and 2021, mostly quantitative studies written in English. One study was published in 2018, three in 2019, three in 2020, and two in 2021. **Conclusion:** Negative pressure therapy stands out as an effective option for the treatment of complex wounds, offering significant benefits in reducing postoperative complications and accelerating healing.
Keywords: Bandages; Wounds and Injuries; Negative-Pressure Wound Therapy.

RESUMEN
Introducción: La piel, el órgano más grande del cuerpo humano, desempeña una función esencial como barrera protectora contra el ambiente externo. Cualquier interrupción en su integridad se considera una herida. La terapia de presión negativa es un método adyuvante significativo en el tratamiento de heridas, con el objetivo principal de acelerar el proceso de reparación y preparar el lecho de la herida para su cobertura definitiva a través de diferentes técnicas de reconstrucción tisular. **Objetivo:** Identificar las evidencias científicas relacionadas con el tratamiento de heridas crónicas con terapia de presión negativa. **Métodos:** Se trata de una revisión integrativa realizada en la Biblioteca Virtual en Salud, el Portal de Periódicos CAPES, SciELO y PubMed, utilizando los descriptores controlados "Bandagens/Bandages", "Ferimentos e lesões/Wounds and Injuries" y "Tratamento de ferimentos com pressão negativa/Negative-Pressure Wound Therapy". Se adoptaron como criterio de inclusión los artículos en portugués, inglés y español, disponibles en texto completo, producidos entre 2017 y 2022 y que respondieran a la pregunta orientadora: ¿Cuáles son las evidencias científicas sobre el uso de la presión negativa en heridas crónicas? Resultados: Se seleccionaron nueve estudios, publicados entre 2018 y 2021, en su mayoría estudios cuantitativos, escritos en inglés, siendo un estudio publicado en 2018, tres publicados en 2019, tres publicados en 2020 y dos publicados en 2021. **Conclusión:** La terapia de presión negativa se destaca como una opción eficaz para el tratamiento de heridas complejas, ofreciendo beneficios significativos en la reducción de complicaciones postoperatorias y en la aceleración de la cicatrización.
Palabras clave: Bandages; Heridas y Lesiones; Terapia de Presión Negativa para Heridas

RESUMO
Introdução: A pele, o maior órgão do corpo humano, desempenha uma função essencial como barreira protetora contra o ambiente externo. Qualquer interrupção na sua integridade é considerada uma ferida. A terapia por pressão negativa é um método adjuvante significativo no tratamento de feridas, com o objetivo principal de acelerar o processo de reparação e preparar o leito da ferida para sua cobertura definitiva através de diferentes técnicas de reconstrução tecidual. **Objetivo:** Identificar as evidências científicas relacionadas ao tratamento de feridas crônicas com terapia por pressão negativa. **Métodos:** Trata-se de uma revisão integrativa realizada na Biblioteca Virtual de Saúde, Portal de periódicos CAPES, SciELO e PubMed, com os descritores controlados "Bandages", "Ferimentos e lesões" e "Tratamento de ferimentos com pressão negativa". Adotaram-se como critério de inclusão os artigos em português, inglês e espanhol, disponíveis na íntegra, produzidos no período de 2017 a 2022 e que responderam à questão norteadora: Quais evidências científicas sobre o uso da pressão negativa em feridas crônicas? **Resultados:** Foram selecionados nove estudos, publicados entre 2018-2021, majoritariamente estudos quantitativos, escritos em inglês, sendo um estudo publicado em 2018, três publicados em 2019, três publicados em 2020 e dois publicados em 2021. **Conclusão:** A terapia por pressão negativa se destaca como uma opção eficaz para o tratamento de feridas complexas, oferecendo benefícios significativos na redução de complicações pós-operatórias e na aceleração da cicatrização.
Palavras-chave: Bandagens; Ferimentos e Lesões; Tratamento de Ferimentos com Pressão Negativa.

REVISTA ENFERMAGEM ATUAL IN DERME

INTRODUCTION

The skin, the largest organ in the human body, plays an essential role as a protective barrier against the external environment. Any interruption in its integrity is considered a wound. The healing process, which begins after this rupture, occurs through a series of coordinated and interdependent events, distributed in four main phases: hemostasis, inflammation, proliferation, and, finally, maturation and remodeling[1].

Wounds can be classified as acute or chronic. Acute wounds present a controlled inflammatory response and follow a predictable healing pattern, usually closing without complications within three weeks after their appearance[2]. Chronic wounds are those that do not progress adequately through the ordered phases of healing, remaining stagnant in the inflammatory phase, even with appropriate management. They can persist from four weeks to more than three months[2,3].

Several factors can complicate the wound healing process, including the duration of the wound, its extension and depth, constant pressure on the injured area, the presence of infection, edema, smoking, alcoholism and the inappropriate use of topical agents. In addition, the use of local antibiotics, incorrect dressing techniques, advanced age, inadequate nutrition, obesity, anemia and the use of systemic medications such as anti-inflammatories, immunosuppressants, chemotherapy and radiotherapy also have a negative influence. Emotional conditions such as stress, anxiety and depression can also affect healing[4].

Therefore, negative pressure wound therapy (NPT) is a significant adjuvant method in the treatment of wounds, with the main objective of accelerating the repair process and preparing the wound bed for its definitive coverage through different tissue reconstruction techniques[5]. This type of active treatment promotes healing in a moist environment, using an interface material, such as foam or gauze, to which subatmospheric pressure is applied to remove exudate[6].

Negative pressure wound therapy offers several benefits, including exudate control, edema reduction, promotion of effective angiogenesis to maintain vascular permeability in the injured area, early emergence of granulation tissue, and reduction of complications such as infections[7]. Wound care is a fundamental skill for nurses, who need to have theoretical knowledge based on evidence to ensure quality care for patients with wounds and to prevent the occurrence of these injuries[8].

Wound care is assigned to nurses according to Resolution 501/2015 of the Federal Nursing Council. This professional has the ability to perform nursing consultations, prescribe and apply dressings, coordinate and supervise the nursing team in wound prevention and treatment, and record the evolution of injuries, among other specific responsibilities[9].

In this context, the objective of the present study was to identify scientific evidence related

REVISTA ENFERMAGEM ATUAL IN DERME

to the treatment of chronic wounds with negative pressure therapy.

METHODS

This is an integrative review (IR), a type of review based on clinical practice and classifying research according to levels of evidence. It seeks to analyze and synthesize research results in a systematic way, to contribute to decision-making and improvement in clinical practice[10].

To conduct an IR, Ursi and Galvão [11] recommend the following steps: identification of the research topic; elaboration of a guiding question; search process, which includes descriptors, search strategy and choice of inclusion and exclusion criteria; categorization of studies; evaluation of studies included in the IR; interpretation and discussion of results and presentation of the IR.

The guiding question was elaborated according to the PICo strategy (P = Problem, I = Phenomenon of Interest, C = Context) [12], being defined as: "What scientific evidence is there on the use of negative pressure in chronic wounds in clinical and hospital settings?" Where P = Patients with chronic wounds, I = Negative pressure, C = Treatment of chronic wounds in a clinical or hospital setting.

We selected the articles in the literature by searching the Virtual Health Library (VHL), CAPES and SciELO journal portals, and the National Library of Medicine National Institutes of Health (PubMed) database.

The search was conducted in April 2022, concomitantly, using the controlled descriptors Health Sciences Descriptors (DeCS) and Medical Subject Headings (Mesh) – “Bandagens/Bandages”, “Ferimentos e memórias/Wounds and Injuries” and “Tretamento de pecados com pressão negativa/Negative-Pressure Wound Therapy”.

Below, we highlight the search strategy for the studies according to each database, journal portal, or virtual library (Table 1).

Table 1 – Search strategy for the studies. São Paulo, SP – 2022.

Study search strategy	
BVS	Bandages AND “Wounds and injuries” AND “Negative pressure wound treatment”
SciELO	“Negative pressure wound treatment”
CAPES	“Negative pressure wound treatment”
PubMed	“Negative-Pressure Wound Therapy”.

Source: study's own.

The inclusion criteria for selecting articles were: primary studies published between 2017 and 2022, in Portuguese, English and Spanish, and available in full.

REVISTA ENFERMAGEM ATUAL IN DERME

The exclusion criteria adopted were: literature reviews, conference abstracts, books, editorials, theses, case studies and primary studies that do not answer the guiding question, do not discuss the treatment of chronic wounds or were not performed on humans.

To extract information from the selected studies, an instrument proposed by Ursi and Galvão [11] was used, which allows the analysis of studies based on the following variables: study identification, methodological characteristics and assessment of methodological rigor.

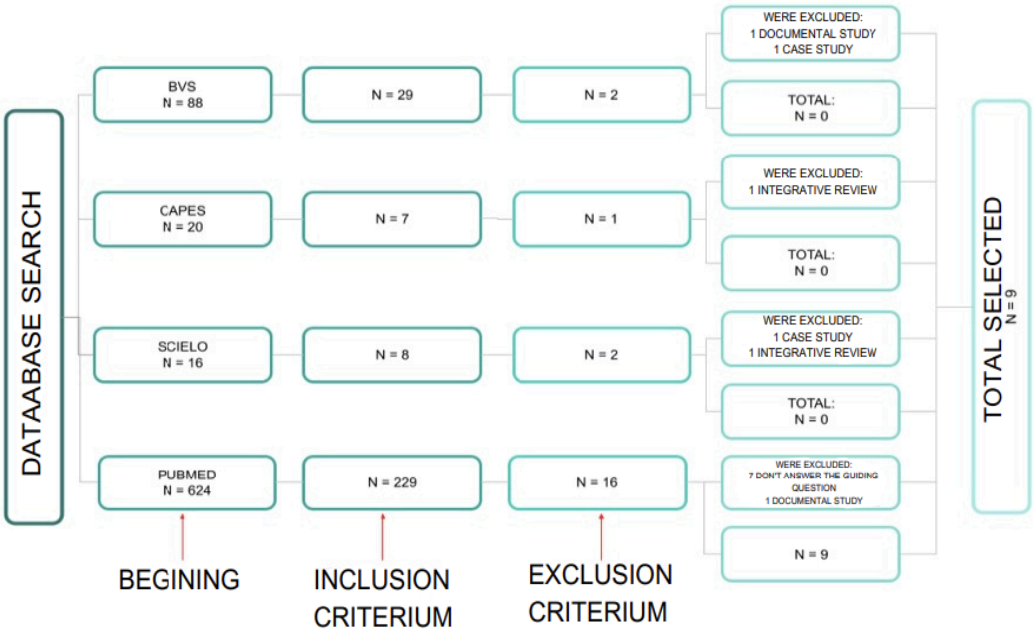
The descriptive form was adopted for the analysis of data from the selected studies, which is presented as a summary of the studies and comparison between research studies.

RESULTS

Preliminary studies were identified in the VHL, 16 studies in SciELO, 20 studies in the CAPES journal portal and 624 studies in PubMed.

After applying the inclusion and exclusion criteria, it was observed that the number of studies increased to 21 and after reading the titles and abstracts of the references, seven studies that did not answer the guiding question, five that were not primary studies and without duplicates were excluded. The sample of this IR consisted of nine primary studies. The selection of primary studies was carried out according to the flowchart described in Figure 1.

Figure 1 - Search flowchart.



REVISTA ENFERMAGEM ATUAL IN DERME

Regarding the characterization of the selected primary studies (Table 2), they are mostly quantitative studies, written in English, with one study published in 2018, three published in 2019, three published in 2020 and two published in 2021.

Table 2 – Characteristics of the primary studies selected for Integrative Review. São Paulo, SP – 2022.

Authors	Title	Year/ Country	Type of study	Evidence Level
Borys, et al. [13]	Negative-pressure wound therapy for management of chronic neuropathic noninfected diabetic foot ulcerations – short-term efficacy and long-term outcomes	2018, Poland	Quantitatives non-randomized	III (Intervention)
Brown, et al. [14]	Multiple Interventions for Diabetic Foot Ulcer Treatment Trial (MIDFUT): study protocol for a randomized controlled trial	2020, England	Quantitative randomized clinical trial	II (Intervention)
Carrano, et al. [15]	Negative-pressure wound therapy after stoma reversal in colorectal surgery: a randomized controlled trial	2021, Italy	Quantitative randomized clinical trial	II (Intervention)
Kirsner, et al. [16]	A prospective, randomized, controlled clinical trial on the efficacy of a single-use negative pressure wound therapy system, compared to traditional negative pressure wound therapy in the treatment of chronic ulcers of the lower extremities	2019, United States	Quantitative randomized clinical trial	II (Intervention)
Liu, et al. [17]	Study on the Effect of the Five-in-One Comprehensive Limb Salvage Technologies of Treating Severe Diabetic Foot	2019, China	Quantitative randomized clinical trial	II (Intervention)
Papp [18]	Incisional negative pressure therapy reduces complications and costs in pressure ulcer reconstruction	2019, Canada	Quantitative randomized clinical trial	II (Intervention)
Seidel, et al. [19]	Negative pressure wound therapy compared with standard moist wound care on diabetic foot ulcers in real-life clinical practice: results of the German DiaFu-RCT	2020, Germany	Quantitative randomized clinical trial	II (Intervention)
Wierdak, et al.[20]	Prophylactic negative-pressure wound therapy after ileostomy reversal for the prevention of wound healing complications in colorectal cancer patients: a randomized controlled trial	2020, Poland	Quantitative randomized clinical trial	II (Intervention)
Yane, et al. [21]	The technique for less infectious and earlier healing of stoma closure wound: negative pressure wound therapy with instillation and dwelling followed by primary closure	2021, Japan	Quantitative descriptive	VI (Intervention)

Source: study's own.

REVISTA ENFERMAGEM ATUAL IN DERME

DISCUSSION

The study by Papp [18] demonstrated that TPN applied to incisional pressure injury (PI) dressings had several positive outcomes. TPN was associated with a significant reduction in postoperative complications, decreased length of hospital stay, and reduced recurrent open wounds after three months, indicating significant cost savings. In addition, patients who did not use TPN were 4.3 times more likely to develop complications compared to the group that received the therapy, reinforcing the safety and efficacy of TPN in patients with acute spinal cord injury.

The authors[20] also found positive evidence for the use of TPN. In a randomized controlled trial, TPN was applied prophylactically after ileostomy closure in patients undergoing colorectal resection for cancer. The results showed a lower incidence of wound healing complications and surgical site infections (SSI) in the NPT group, with an SSI rate of 5.71% compared to 22.2% in the control group. However, there was no significant difference in the length of postoperative hospital stay between the groups.

On the other hand, the study by Carrano et al. [15] presented divergent results when evaluating NPT in patients undergoing stoma reversal. Despite not observing significant differences in the rate of wound complications and the rate of surgical site infection, the NPT group had less pain, greater aesthetic satisfaction, and a higher healing rate after 30 days. These findings suggest that, despite there being no marked differences in complication and infection rates, NPT may offer benefits in terms of comfort and aesthetics.

The authors[21] explored the efficacy of TPN in delayed primary wound closure, highlighting the reduced burden on medical staff and patients, and decreased outpatient return visits. Although the study was limited by the small number of participants, the results suggest that TPN may be an effective option for the closure of stoma wounds without associated complications.

The authors[13] evaluated TPN in patients with type 2 diabetes mellitus and neuropathic wounds, finding a healing rate of 55.1% in the TPN group, compared with 73.7% in the control group, and similar recurrence rates between groups. Brown et al. [14] are conducting a multicenter study exploring different combinations of adjunctive treatments for diabetic foot ulcers, and the final results may provide further insight into the efficacy of TPN in conjunction with other therapies.

The study by Seidel et al. [19] in Germany did not find significant results related to wound closure with TPN compared to standard therapy, possibly due to complications such as lack of documentation and unauthorized changes in therapy. However, the study indicated that TPN can accelerate wound bed preparation. Liu et al. [17] corroborate the efficacy of TPN, but warn of methodological flaws and unbiased evidence in some trials.

REVISTA ENFERMAGEM ATUAL IN DERME

Finally, the study by Kirsner et al. [16] compared two types of TPN systems, showing that the single-use, portable, and disposable system had superior performance in terms of reducing wound dimensions compared to traditional systems. Kirsner et al. [16] recommend the use of the single-use system as the first choice for the treatment of challenging ulcers.

Despite the promising evidence, limitations of the reviewed studies include variability in methodologies, small sample sizes, and lack of standardization in evaluation criteria. Some studies presented problems such as lack of adequate documentation and unauthorized changes in therapy, which may have impacted the validity of the results. In addition, the heterogeneity of the types of injuries and populations studied may limit the generalizability of the findings.

FINAL CONSIDERATIONS

TPN stands out as an effective option for the treatment of complex wounds, offering significant benefits in reducing postoperative complications and accelerating healing. The therapy has the potential to improve patient satisfaction with wound care, reduce pain, and improve wound aesthetics. The use of single-use TPN systems may also represent a significant improvement over traditional systems, offering a practical and effective solution for the management of challenging ulcers. The results suggest that TPN should be considered a viable option in specific clinical situations, but further research is needed to confirm its efficacy in different settings and populations.

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Declaration of conflict of interest

Nothing to declare.

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