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Effectiveness of Negative Pressure Wound Therapy in Reducing Postoperative Complications: A Systematic Review

Eficacia de la terapia de presión negativa en la reducción de complicaciones de heridas posquirúrgicas: una revisión sistemática

Eficácia da terapia por pressão negativa na redução de complicações de feridas pós-operatórias: uma revisão sistemática

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Abstract: Introduction: Postoperative wound complications, such as infections, seromas, and dehiscence, represent a global health challenge. Negative Pressure Wound Therapy (NPWT) is an advanced technique that accelerates wound healing through the application of controlled subatmospheric pressure, reducing the risk of infection and promoting tissue regeneration. Objective: To analyze the effectiveness of NPWT in reducing postoperative complications and improving clinical outcomes in various surgical contexts. Methodology: A systematized review was conducted following the PRISMA guidelines. The following databases were consulted: PubMed, Scopus, Web of Science, SciELO, LILACS, Redalyc, Dialnet, ScienceDirect, Medigraphic and Ciberindex. DeCS and MeSH descriptors were used, including: "negative pressure wound therapy," "wound healing," "surgical wound infection," and "postoperative complications," along with their Spanish equivalents, combined using Boolean operators AND and OR. Studies published between 2017 and 2024 in English, Spanish, and Portuguese were included. Results: The reviewed studies demonstrated that NPWT significantly reduces the incidence of infections (by approximately 35 % compared to conventional methods) and dehiscence (by 30-40 %). Key success factors include wound location, type of surgery, and individual patient characteristics such as obesity, diabetes, and advanced age. Conclusions: The evidence suggests that NPWT is an effective intervention for reducing postoperative complications —particularly infections and dehiscence— in patients with complex wounds and comorbidities. The studies report consistent improvements in healing time and clinical outcomes, especially in high-risk surgical procedures.

Keywords: negative pressure wound therapy; postoperative complications; wound healing; surgical wound; surgical wound infection.

Resumen: Introducción: Las complicaciones en heridas postquirúrgicas, como infecciones, seromas y dehiscencias, representan un desafío global en salud. La terapia de presión negativa (TPN) es una técnica avanzada que acelera la cicatrización mediante presión subatmosférica controlada, reduciendo el riesgo de infecciones y promoviendo la regeneración tisular. Objetivo: Profundizar en la eficacia de la TPN en la reducción de complicaciones posoperatorias y mejorar los resultados clínicos en diversos contextos quirúrgicos. Metodología: Se realizó una revisión sistemática basada en la guía PRISMA. Se consultaron las bases de datos PubMed, Scopus, Web of Science, SciELO, LILACS, Redalyc, Dialnet, ScienceDirect, Medigraphic y Ciberindex. Se utilizaron descriptores DeCS y MeSH como: "negative pressure wound therapy", "wound healing", "surgical wound infection", "postoperative complications" y sus equivalentes en español, combinados mediante operadores booleanos AND y OR. Se incluyeron estudios publicados entre 2017 y 2024, en inglés, español y portugués. Resultados: Los artículos analizados evidenciaron que la TPN reduce significativamente la incidencia de infecciones (35 % en comparación con métodos convencionales) y dehiscencias (30-40 % menos). Los factores determinantes para el éxito de la TPN incluyen la localización, el tipo de cirugía y características individuales como obesidad, diabetes y edad avanzada. Conclusiones: La evidencia indica que la TPN es una intervención eficaz para reducir complicaciones posquirúrgicas, especialmente infecciones y dehiscencias, en pacientes con heridas complejas y comorbilidades. Los estudios muestran mejoras consistentes en los tiempos de cicatrización y en los desenlaces clínicos en cirugías de alto riesgo.

Palabras clave: terapia de presión negativa para heridas; complicaciones posoperatorias; cicatrización de heridas; herida quirúrgica; infección de la herida quirúrgica.

Resumo: Introdução: As complicações em feridas pós-operatórias, como infecções, seromas e deiscências, representam um desafio global em saúde. A terapia por pressão negativa (TPN) é uma técnica avançada que acelera a cicatrização por meio de pressão subatmosférica controlada, reduzindo o risco de infecções e promovendo a regeneração tecidual. Objetivo: Aprofundar na eficácia da TPN na redução de complicações pós-operatórias e melhorar os resultados clínicos em diversos contextos cirúrgicos. Metodologia: Foi realizada uma revisão sistematizada com base nas diretrizes do PRISMA. Foram consultadas as bases de dados: PubMed, Scopus, Web of Science, SciELO, LILACS, Redalyc, Dialnet, ScienceDirect, Medigraphic e Ciberindex. Utilizaram-se descritores DeCS e MeSH como: "negative pressure wound therapy", "wound healing", "surgical wound infection", "postoperative complications" e seus equivalentes em espanhol, combinados por meio de operadores booleanos AND e OR. Foram incluídos estudos publicados entre 2017 e 2024, em inglês, espanhol e português. Resultados: Os artigos analisados evidenciaram que a TPN reduz significativamente a incidência de infecções (35% em comparação com métodos convencionais) e deiscências (30–40% a menos). Os fatores determinantes para o sucesso da TPN incluem localização, tipo de cirurgia e características individuais como obesidade, diabetes e idade avançada. Conclusões: As evidências indicam que a TPN é uma intervenção eficaz para reduzir complicações pós-operatórias, especialmente infecções e deiscências, em pacientes com feridas complexas e comorbidades. Os estudos mostram melhorias consistentes nos tempos de cicatrização e nos desfechos clínicos em cirurgias de alto risco.

Palavras-chave: terapia por pressão negativa para feridas; complicações pós-operatórias; cicatrização de feridas; ferida cirúrgica; infecção da ferida cirúrgica.

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Introduction

The incidence of postoperative wound complications is a global concern in the healthcare field. According to data from the World Health Organization (WHO), approximately 11 % of surgical procedures in developed countries result in surgical site infections (SSIs). [1] In Latin America, the prevalence of SSIs may be even higher, with reported rates reaching up to 11.2 % in some regions, particularly in low- and middle-income countries. [2] A quantitative observational study conducted in a hospital-clinic in Guayaquil, Ecuador, with a sample of 19 patients, identified the most frequent postoperative complications, among which surgical site infection (45 %) was the most common, followed by seromas (24.9 %), hematomas (15.6 %), and dehiscence (14.6 %). [3]

Surgical wounds are controlled disruptions of the integrity of the skin and underlying tissues resulting from incisions made during surgical procedures. [3] Although these wounds are the result of precise and controlled actions, they are still exposed to postoperative complications such as SSIs, seromas, hematomas, and dehiscence, which can have significant clinical consequences, including prolonged hospital stays and the need for additional interventions. [4] The classification of surgical wounds is based on the degree of contamination, being categorized as clean, clean-contaminated, contaminated, and dirty. This classification influences the risk of complications and, consequently, the therapeutic approach required. [4, 5]

In this context, Negative Pressure Wound Therapy (NPWT) emerged as an advanced and effective alternative for managing surgical wounds. Introduced in 1997 by Drs. Argenta and Morykwas, [6] NPWT is based on the application of controlled subatmospheric pressure to accelerate wound healing. This approach promotes the removal of exudate, reduces edema, stimulates angiogenesis, and facilitates the formation of granulation tissue. [6] The NPWT system consists of a porous sponge, usually made of polyurethane, placed inside the wound cavity, covered with an occlusive dressing connected to a suction device. This creates an ideal environment for healing and reduces bacterial load. [5- 7]

NPWT was introduced as an alternative to conventional wound care methods such as wet-to-dry dressings and has proven effective in reducing postoperative complications. It promotes faster healing and improves clinical outcomes, as supported by randomized clinical trials, observational studies, and meta-analyses. [7] The benefits of NPWT have been documented in various types of surgical wounds, including abdominal, orthopedic, plastic, and reconstructive surgeries, as well as cesarean sections and gynecological procedures.

Considering the importance of minimizing postoperative complications and their impact on both patients and healthcare systems, this systematized review aimed to analyze the effectiveness of NPWT in reducing postoperative complications, with a focus on improving clinical outcomes across different surgical contexts.

Methodology

This study was based on a systematic review following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The research aimed to analyze the effectiveness of Negative Pressure Wound Therapy (NPWT) in reducing postoperative wound complications, structured under the PICOT format: In patients undergoing surgery, does the application of negative pressure wound therapy compared to conventional surgical wound management reduce postoperative complications, as reported in primary quantitative studies (descriptive, case-control), case reports, systematic reviews, and meta-analyses published between 2017 and 2024?

Scientific articles and research papers were retrieved from various academic and scientific databases, including PubMed, Scopus, Web of Science, SciELO, Redalyc, Dialnet, Medigraphic, and Ciberindex. The search strategy included keywords and thesauri from Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS), which were combined using Boolean operators (AND, OR) to optimize the accuracy and relevance of the results.

The search was limited to the period from 2017 to 2024, given that the application of NPWT in the context of postoperative wound complications is an emerging line of research, with significant and high-quality evidence becoming available starting in 2017. Articles were selected in Spanish, English, and Portuguese.

Table 1 presents the search strategy.

Table 1 – Search strategy

Objective	Databases	Keywords/descriptors	Boolean operators	Retrieved articles
Evaluate the effectiveness of NPWT in postoperative wounds	PubMed, Scopus, SciELO, LILACS, ScienceDirect	"terapia de presión negativa para heridas", "complicaciones posoperatorias", "cicatrización de heridas", "herida quirúrgica" "infección de la herida quirúrgica" "negative-pressure wound therapy", "postoperative complications" "wound healing" "surgical wound" "surgical wound infection"	("negative pressure wound therapy" or "postoperative complications")	23
	PubMed, Scopus, SciELO, LILACS, ScienceDirect	"terapia de presión negativa para heridas", "complicaciones posoperatorias", "cicatrización de heridas", "herida quirúrgica" "infección de la herida quirúrgica" "negative-pressure wound therapy", "postoperative complications" "wound healing" "surgical wound" "surgical wound infection"	("negative pressure wound therapy" and wound healing"	8
	PubMed, Scopus, SciELO, LILACS, ScienceDirect	"terapia de presión negativa para heridas", "complicaciones posoperatorias", "cicatrización de heridas", "herida quirúrgica" "infección de la herida quirúrgica" "negative-pressure wound therapy", "postoperative complications" "wound healing" "surgical wound" "surgical wound infection"	("wound healing" or "complications")	14
	PubMed, Scopus, SciELO, LILACS, ScienceDirect	"terapia de presión negativa para heridas", "complicaciones posoperatorias", "cicatrización de heridas", "herida quirúrgica" "infección de la herida quirúrgica" "negative-pressure wound therapy", "postoperative complications" "wound healing" "surgical wound" "surgical wound infection"	("negative pressure wound therapy" or "postoperative complications") and ("wound healing" or "complications")	19

The methodological quality of the included studies was evaluated using the CASPe (Critical Appraisal Skills Programme) checklists, selecting the format according to the type of study. This tool allowed identification of strengths and weaknesses regarding internal validity, objectives, design, and applicability of results. Additionally, the GRADE system (Grading of Recommendations, Assessment, Development and Evaluation) was applied to assess the certainty of evidence, considering risk of bias, consistency, precision, and applicability of findings.

The SCImago Journal Rank (SJR) was used to assess the impact of scientific journals, without replacing critical appraisal of content. In randomized clinical trials, the Cochrane risk-of-bias tool was also applied. [8]

The information retrieval and selection process followed PRISMA guidelines and included three stages: database review, application of inclusion and exclusion criteria, and critical appraisal using CASPe and GRADE, allowing rigorous interpretation of the studies in response to the research question.

To ensure proper data organization, tools such as Zotero, Excel, and Microsoft Word were used to classify the studies in tables. This facilitated the selection of relevant articles and the exclusion of those not aligned with the study objectives.

This article emphasized adherence to copyright regulations and proper source attribution. During the study selection process, measures were taken to avoid selection bias, ensuring that the inclusion of studies was objective and based on predefined criteria.

Study selection

The studies underwent a progressive selection process based on: rates of postoperative complications, effectiveness of NPWT compared to conventional methods, and clinical outcome influencers (e.g., type of surgery or patient characteristics).

Results

Following the systematized review according to the specifications described in the methodology, 48 publications were initially identified. Of these, 18 articles met the inclusion criteria for full reading; 30 publications were excluded, including 9 due to lack of free access, 16 that were not relevant to the research objective, and 5 duplicates.

Ultimately, 18 articles were included in this systematized review. Methodological analysis revealed that 6 of the articles were observational descriptive studies (33.3 %), which reported clinical experiences and preliminary results regarding the application of Negative Pressure Wound Therapy. Additionally, 6 case studies (33.3 %) explored the individual progress of patients treated with NPWT in specific clinical settings. Two cost-analysis studies were identified: one based on a literature review and another on a clinical case (11.1 %). Furthermore, two narrative systematic reviews (11.1 %) and one systematized review (5.5 %) were included, which synthesized secondary evidence on NPWT effectiveness. Finally, one retrospective case-control study (5.5 %) was found, comparing NPWT to conventional methods. This methodological diversity provided a broad and complementary perspective on the effectiveness and applicability of NPWT in different clinical scenarios.

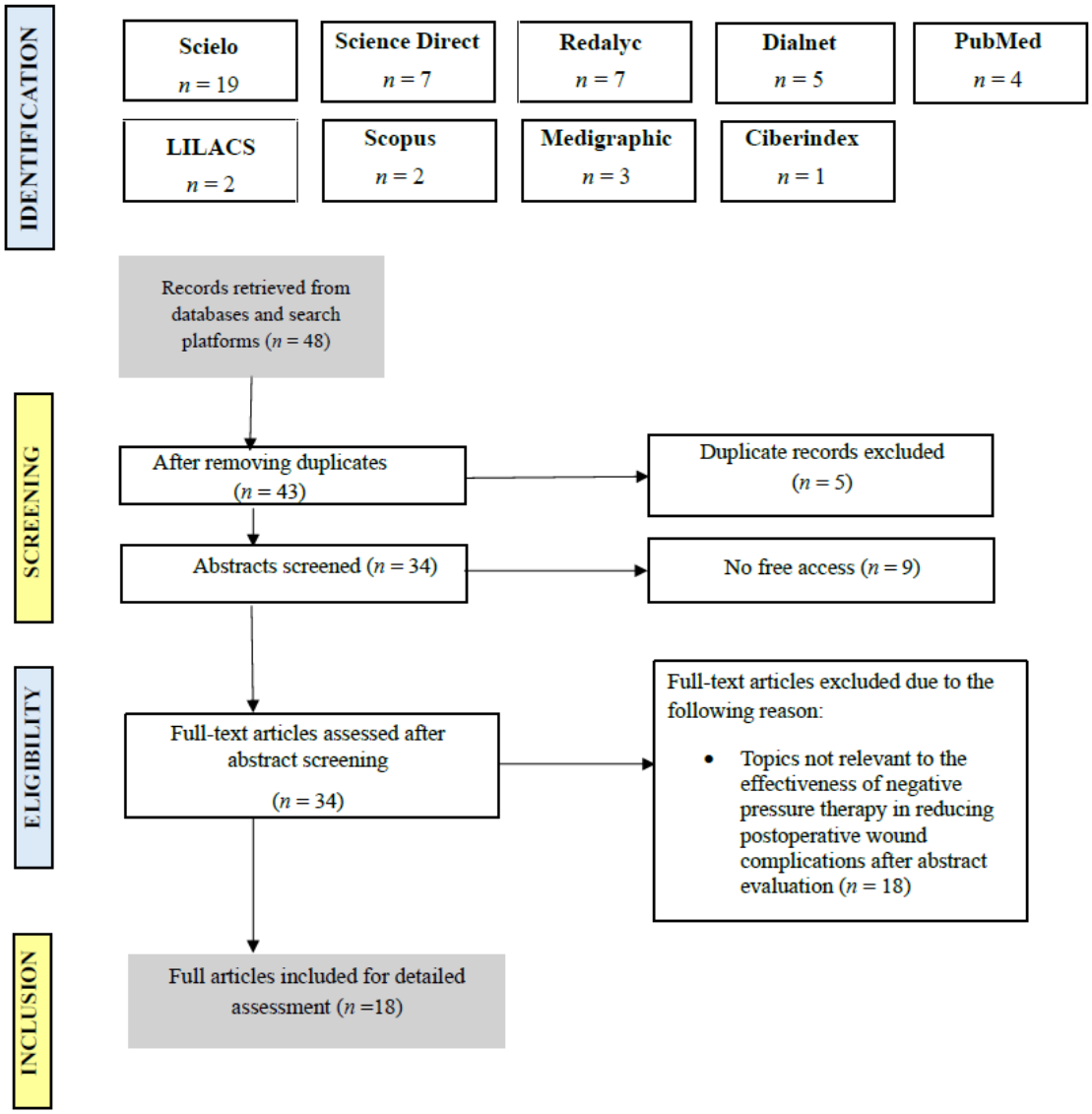

Figure 1. Flow diagram describing the process of search, identification, screening, eligibility, and inclusion of studies for results analysis.

The 18 articles selected for this systematized review were published between 2017 and 2024 and directly address the use of Negative Pressure Wound Therapy in postoperative wounds. The majority are quantitative studies, with a predominance of descriptive approaches, case reports, and systematic reviews, published in Spanish, English, and Portuguese (the latter translated into Spanish for analysis). To ensure the quality of the evidence, the 18 articles were evaluated using the SCImago Journal Rank (SJR), a ranking metric that assesses the impact of scientific publications by grouping them into quartiles based on the number of citations and the relevance of the journal in which they were published. [9] These results are presented in Table 2.

Table 2 – Quality assessment of selected articles using SCImago Journal Rank (SJR) and Critical Appraisal Skills Programme (CASPe)

Article	SJR	(CASPe)
Ocaña Jiménez et al. [5] 2019 The role of negative pressure therapy in the prevention of surgical site infection in colorectal surgery.	Q2	Moderate
Bueno-Lledó et al. [6] 2022 Negative pressure therapy in abdominal wall surgery.	Q2	Low
Cerezo-Millán et al. [7] 2018 Healthcare personnel's knowledge on the use of negative pressure therapy in wound treatment.	Q2	Moderate
Norman Gill et al. [10] 2022 Negative pressure wound therapy for surgical wounds healing by primary closure.	Q1	Moderate
Santana-Romero et al. [11] 2023 Negative pressure system as treatment for thoracic window: case report.	Q2	Low
Quilindo Giraldo et al. [12] 2020 Negative pressure therapy as an alternative treatment for arterial vascular ulcer in lower limbs.	Q2	Moderate
de Castro Oliveira et al. [13] 2020 Negative pressure wound therapy in the treatment of surgical site infection in cardiac surgery.	Q2	Moderate
García-Montero et al. [14] 2018 Multidisciplinary approach to infected abdominal dehiscence: cost-consequence evaluation of dressings and measures used.	Q3	Moderate
Andrade-Alegre et al. [15] 2022 Negative pressure therapy for patients with subcutaneous emphysema and massive pneumomediastinum.	Q2	Moderate
Pontillo-Walerovsky et al. [16] 2022 Negative pressure is a treatment for mesh exposure after eventroplasty.	Q2	Moderate
Cervera-Simón y Vila-Abad [17] 2023 Comparison between moist wound healing and negative pressure therapy in pressure ulcers.	Q1	Moderate
Ibáñez Rodríguez et al. [18] 2021 Is negative pressure therapy feasible in home hospitalization?: case report.	Q2	Low
García-Corral et al. [19] 2019 Negative pressure therapy combined with fascial traction using mesh in the treatment of infected pancreatic necrosis.	Q2	Moderate
Fuentes et al. [20] 2023 E-VAC therapy for complications in gastrointestinal surgery at a gastroenterology reference center in Colombia: case series.	Q1	Moderate
Sánchez Sánchez et al. [21] 2020 Management of complex wounds with difficult healing using Negative Pressure Therapy.	Q4	Moderate
Monroy Hernández y López Ugalde [22] 2023 Negative pressure wound therapy in descending necrotizing fasciitis of the retropharyngeal space as a substitute for surgical treatment.	Q2	Moderate
Bermúdez et al. [23] 2017 Impact of vacuum therapy in the treatment of deep infections and mediastinitis after median sternotomy over the last 10 years.	Q1	Moderate
González Magaña et al. [24] 2017 Use of vacuum-assisted closure (VAC) systems in infected surgical wounds in the cervicofacial region.	Q2	Low

For the data extraction process, an organized approach was employed through the development of a table encompassing various indicators to classify the reviewed articles. These indicators include author(s), year of publication, article title, country, database, study

type, level of evidence, and findings. This detailed classification enabled the grouping, comparison, and subsequent drafting of the systematic review article. Structuring the information in this manner facilitated a coherent synthesis of the results and contributed to the orderly presentation of the systematic review.

Table 3 – Classification by author, year, title, country, database, study type, and findings

Authors	Year	Title	Country	Database	Study type	Level of evidence (GRADE)	Findings
Ocaña Jiménez et al. [5]	2019	Role of negative pressure therapy in the prevention of surgical site infection in colorectal surgery.	Spain	Elsevier	Case-control study	Moderate	- NPT significantly reduces complications such as infections and seromas. - Shortens hospital stay compared to conventional dressings. - Its effectiveness varies according to wound type and surgical technique.
Bueno-Lledó et al. [6]	2022	Negative pressure therapy in abdominal wall surgery.	Spain	Elsevier	Special article	Moderate	- NPT reduces infection rates and accelerates healing compared to traditional methods. - Additional benefits include wound size reduction and prevention of dehiscence in at-risk patients.
Cerezo-Millán et al. [7]	2018	Healthcare personnel's knowledge regarding the use of negative pressure therapy in wound treatment.	Spain	SciELO	Descriptive study	Low	- NPT is effective in lowering infection rates in high-risk wounds. - Accelerates healing by improving blood flow and promoting granulation tissue formation. - Reduces wound size and prevents dehiscence, especially in obese and diabetic patients.
Norman Gill et al. [10]	2022	Negative pressure wound therapy for surgical wounds healing by primary closure.	United Kingdom	PubMed	Systematic review	High	- NPT helps reduce complications and improves wound healing. - Clinical cases show reduced infection rates and healing time compared to conventional methods.
Santana-Romero et al. [11]	2023	Negative pressure system as treatment for thoracic window: case report.	Mexico	LILACS	Case study	Moderate	- Significant reduction in air and fluid leakage. - Improved wound healing with better edge approximation. - Four-week treatment duration showed progress in thoracic window resolution.

Quilindo Giraldo et al. [12]	2020	Negative pressure therapy as alternative treatment for arterial vascular ulcer of lower limbs.	Colombia	SciELO	Case study	Moderate	- NPT promotes healing and wound closure in vascular ulcers. - Effective in managing complex wounds and reducing postoperative complications.
de Castro Oliveira et al. [13]	2020	Negative pressure wound therapy in treating surgical site infection after cardiac surgery.	Brazil	PubMed	Descriptive study	Low	- NPT effectively reduces postoperative complications after cardiac surgery. - Promotes rapid exudate removal and granulation tissue formation. - Relevant in managing surgical site infections.
García-Montero et al. [14]	2018	Multidisciplinary approach to infected abdominal dehiscence: cost-consequence assessment of dressings and measures used.	Spain	SciELO	Cost analysis based on a case study	Low	- A 2017 meta-analysis showed a 26% reduction in dehiscence with NPT surgical dressings in high-risk patients. - NPT dressings (NPWTSD) are suitable for use in primary care and significantly reduce postoperative complications.
Andrade-Alegre et al. [15]	2022	Negative pressure therapy for patients with subcutaneous emphysema and massive pneumomediastinum.	Colombia	SciELO	Case report	Low	- NPT significantly reduces risk of nosocomial infections. - More effective than traditional methods for treating subcutaneous emphysema and severe pneumomediastinum. - Provides effective air aspiration, outperforming closed suction drainage.
Pontillo-Walerovsky et al. [16]	2022	Negative pressure therapy for mesh exposure after eventroplasty.	Paraguay	SciELO	Case study	High	- NPT resulted in low rates of complications such as bleeding and edge maceration. - Enhances early tissue regeneration by stimulating cell proliferation and increasing perfusion. - Helps exudate removal and reduces bacterial load.
Cervera-Simón y Vila-Abad [17]	2023	Comparison between moist wound healing and negative pressure therapy in pressure injuries.	Spain	SciELO	Cost analysis based on literature review	Low	- NPT is preferred for stage III and IV pressure injuries. - Shows better outcomes than moist wound healing. - Higher healing rate and shorter treatment duration, reducing long-term costs.

Ibáñez Rodríguez et al. [18]	2021	Is negative pressure therapy possible in home hospitalization?: case report.	Spain	SciELO	Case report	Moderate	- NPT effectively reduces postoperative complications. - Enhances healing of complex wounds with fewer complications. - Proper device application and patient condition are key to success.
García-Corral et al. [19]	2019	Negative pressure therapy combined with fascial traction using mesh for infected pancreatic necrosis.	Mexico	SciELO	Case study	Moderate	- NPT effectively reduces postoperative complications. - Accelerates healing and reduces the need for additional interventions. - Correct device application is essential for successful therapy.
Fuentes CF et al [20]	2023	E-VAC therapy for complications in gastrointestinal surgery at a Colombian gastroenterology referral center: case series.	Colombia	SciELO	Case series (descriptive observational study)	Moderate	- Six cases of postoperative fistulas and anastomotic dehiscence treated with E-VAC. 66% involved colorectal anastomoses. – Reduced hospital stay (average 22.5 days) and average of 7 dressing changes per patient. E-VAC proved safe and effective in managing these complications.
Sánchez Sánchez et al. [21]	2020	Management of complex, hard-to-heal wound using Negative Pressure Therapy.	Spain	Ciberindex	Descriptive study	Low	- NPT is effective in reducing postoperative complications. - Lower rates of infection and dehiscence compared to conventional methods. - Promotes granulation tissue formation and reduces edema.
Monroy Hernández y López Ugalde [22]	2023	Negative pressure wound therapy in descending necrotizing fasciitis of the retropharyngeal space as an alternative to conventional surgical treatment.	Mexico	Medigraphic	Descriptive study	Low	- NPT significantly reduced wound size (average 65%). - Healing time reduced to 20 days versus 35 days with conventional treatment. - Fewer postoperative complications in the NPT group.
Bermúdez et al. [23]	2017	Impact of vacuum therapy in treating deep infections and mediastinitis after median sternotomy over the past 10 years.	Spain	Elsevier	Descriptive study	Low	- NPT reduced infection rates from 40% to 15% in postoperative treatments. - Reduced healing time, averaging 14 days with NPT. - Early intervention was key to reducing infections.
González Magaña et al. [24]	2017	Use of vacuum-assisted closure (VAC) systems in infected surgical wounds of the cervicofacial region.	Mexico	Medigraphic	Case study	Moderate	- VAC therapy is effective and easy to manage, allowing application in the maxillofacial region. - Positive results in closing large and complex wounds, improving recovery.

Discussion

The results of this systematic review confirm the effectiveness of Negative Pressure Wound Therapy as a relevant intervention for reducing complications in postoperative wounds, especially in patients with comorbidities or those undergoing high-risk procedures. Unlike conventional methods, NPWT not only optimizes the healing process but also appears to alter the clinical course of recovery by significantly decreasing rates of infection, seroma, and dehiscence. [5-7]

This effect has been observed across multiple surgical contexts. In colorectal surgery, for instance, a clear reduction in hospital stays and infection rates has been documented compared to conventional dressings. [5] Likewise, in abdominal wall surgery, NPWT has proven especially beneficial for patients with risk factors such as obesity, diabetes, or immunosuppression, where it accelerates granulation tissue formation and reduces wound size. [6] These findings support the hypothesis that NPWT should not be considered solely as a curative measure, but as a prophylactic strategy with broad clinical impact.

From a pathophysiological standpoint, NPWT promotes healing through modulation of local pressure, increased blood flow, and reduction of exudate, creating an optimal environment for tissue regeneration. This synergy of physiological mechanisms justifies its effectiveness in complex clinical scenarios such as subcutaneous emphysema, pneumomediastinum, [3] or deep vascular ulcers, [14] where traditional methods fail to achieve the same level of therapeutic progression or control.

However, indiscriminate implementation of NPWT in all surgical patients may not be justified. The reviewed evidence suggests that the greatest benefits are observed in high-risk patients or those with complex wounds. Conversely, in low-risk cases or superficial wounds, some authors such as Norman et al. [10] and Fuentes et al. [20] have found no significant differences compared to conventional methods, highlighting the need to establish well-defined clinical criteria for its indication.

These findings reinforce NPWT as an effective clinical intervention, highlighting its utility in various surgical applications and in enhancing healing in patients with risk factors. The reviewed studies, classified within quartiles Q1 and Q4, provide robust evidence supporting the use of this therapy in high-complexity hospital settings, suggesting that its implementation can significantly improve clinical outcomes and reduce complications in postoperative patients. [11, 20]

Regarding safety and potential adverse effects, while most studies highlight the benefits of NPWT in reducing infections, some reports mention mild side effects such as skin irritation and, in rare cases, wound edge necrosis due to prolonged pressure, as described by Andrade-Alegre et al. [15] Additionally, a study conducted by Santana-Romero et al. [11] reports a 5% adverse event rate, emphasizing the importance of proper monitoring in patients with fragile skin or in anatomically challenging areas. This variability in outcomes suggests that the efficacy and safety of NPWT may largely depend on proper protocol application and individual patient factors such as skin type and existing comorbidities. [12, 13]

When comparing these findings with previous reviews, studies such as those by Quilindo-Giraldo et al. [12] and García-Montero et al. [14] have reported positive outcomes in terms of complication reduction but emphasize that the cost of NPWT remains a barrier to widespread implementation in all postoperative patients. Quilindo-Giraldo et al. [12] note that while NPT is effective, its cost-benefit ratio is more favorable in deep wounds and patients with comorbidities, whereas in less complex wounds the benefits do not justify the high

costs—an observation consistent with that of Castro Oliveira et al. [13] Meanwhile, Pontillo-Walerovsky et al. [16] found that when combined with topical agents such as honey, NPWT improves outcomes, opening the door to future research on combined treatments that may reduce costs without sacrificing effectiveness. [17]

The limitations of this review include heterogeneity in the study designs and protocols analyzed. Many studies show variations in the duration of NPWT application and in the criteria used to evaluate healing and complications, which hinders direct comparison of results. [18, 19] Furthermore, most investigations have been conducted in specialized healthcare centers, limiting the generalizability of results to other settings. The lack of long-term follow-up studies also represents a significant limitation, as the long-term impact of NPWT on quality of life and sustained healing remains unknown. [21- 23]

Based on these findings, it can be stated that NPWT represents a valuable therapeutic tool that should be considered a first-line intervention for managing postoperative wounds in high-risk patients. Its selective use, based on precise clinical criteria, can not only improve surgical outcomes but also optimize resource utilization in healthcare institutions. In contrast, its use in low-risk populations should be assessed with caution, prioritizing more cost-effective interventions. [24]

Moreover, it would be beneficial to investigate the combination of NPWT with topical antimicrobial agents, as proposed by Sánchez, [21] to potentially enhance clinical outcomes and reduce costs. The implementation of standardized NPWT protocols in hospitals could optimize clinical practice and allow for a more accurate evaluation of its benefits and limitations in the treatment of postoperative wounds.

Conclusions

Negative Pressure Wound Therapy (NPWT) is established as an effective intervention in reducing postoperative complications, with results supporting its superiority over conventional methods in patients with complex wounds and significant risk factors such as obesity, diabetes, and severe comorbidities. [24] Through this systematic review, it was determined that NPWT consistently decreases rates of infections and dehiscence, while accelerating wound healing through mechanisms such as increased blood flow, granulation tissue formation, and efficient exudate management. Its application has proven particularly beneficial in abdominal, colorectal, and thoracic surgeries, as well as in the treatment of vascular ulcers and advanced infections. [25]

The success of NPWT is influenced by factors such as the type of surgery, wound location, and patient characteristics. The therapy demonstrates high effectiveness in high-risk patients, while in superficial wounds or low-risk individuals, its efficacy appears comparable to that of conventional methods.

Additionally, factors such as proper device application and adequate training of healthcare personnel are essential to optimize outcomes, highlighting the importance of standardized protocols and ongoing professional education. Despite its benefits, NPWT presents certain limitations, including mild adverse effects such as skin irritation and local discomfort, emphasizing the need for careful evaluation to ensure maximum safety and effectiveness.

NPWT represents a valuable clinical tool in the management of surgical wounds, particularly in vulnerable patients and high-complexity settings. However, further large-scale studies with greater methodological rigor, as well as cost-effectiveness analyses, are

needed to support its evidence-based implementation across diverse medical environments and to expand its use in specific populations.

Bibliographical references

1. World Health Organization. WHO recommends 29 ways to stop surgical infections and avoid superbugs [Internet]. WHO; 2025 [cited 2024 Jun 17]. Available from: https://www.who.int/es/news/item/03-11-2016-who-recommends-29-ways-to-stop-surgical-infections-and-avoid-superbugs

2. José-Borjas E, Bejarano S, Martinez-Miranda P, Toledo J, Campos G, Fajardo V, et al. Presencia de infección de sitio quirúrgico en procedimientos gineco-obstétricos en un hospital de II nivel de atención, Honduras 2017-2018. Rev. chil. obstet. ginecol. [Internet]. 2021 [cited 2024 Jun 16];86(1):42-51. doi: 10.4067/S0717-75262021000100042

3. Hinojosa Guerrero JE, Mendez Zuñiga CR, Ostaiza Véliz IV, Ureta Centeno WL. Ventajas del uso de la terapia de presión negativa en heridas quirúrgicas. S. E. [Internet]. 2022 [cited 2024 Jun 17];E(Esp.1). doi: 10.37954/se.v0i0.92

4. Cajas Bejarano CJ. Factores asociados a la complicación de heridas postquirúrgicas. Cirugía General, Hospital General IESS, Milagro. 2018. RECIAMUC [Internet]. 2019 [cited 2024 Sep 19];3(1):464-482. doi: 10.26820/reciamuc/3.(1).enero.2019.464-482

5. Ocaña Jiménez J, Abadía Barno P, Ramos Rubio D, Pina Hernández JD, García Pérez JC, Moreno Montes I, et al. Papel de la terapia presión negativa en la prevención de infección del sitio quirúrgico en cirugía colorrectal. Cir Esp [Internet]. 2019;97(5):268-274. doi: 10.1016/j.ciresp.2019.03.001

6. Bueno-Lledó J, Martínez-Hoed J, Pous-Serrano S. Terapia de presión negativa en cirugía de la pared abdominal. Cir Esp [Internet]. 2022 [cited 2024 Jun 17];100(8):464–71. doi: 10.1016/j.ciresp.2021.12.006

7. Cerezo-Millán P, López-Casanova P, Verdú-Soriano J, Berenguer-Pérez M. Conocimientos del personal sanitario respecto al uso de la terapia de presión negativa en el tratamiento de las heridas. Gerokomos [Internet]. 2018 [cited 2024 Sep 19];29(4):181-191. Available from: https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-928X2018000400181

8. Pardal-Refoyo JL, Pardal-Peláez B. Anotaciones para estructurar una revisión sistemática. Rev ORL [Internet]. 2020 [cited 2024 Oct 11];11(2):155-160. doi: 10.14201/orl.22882

9. Hernández Lalinde JD, Bermúdez V, Arias V, Chacín M, Pahuana M, Barroso M. Indicadores de rendimiento de citas: clasificación e importancia. Arch Venez Farmacol Ter. 2018 [cited 2024 Oct 11];37(3):172-175. Available from: https://www.redalyc.org/journal/559/55963208001/html/

10. Norman G, Shi C, Goh EL, Murphy EMA, Reid A, Chiverton L, et al. Negative pressure wound therapy for surgical wounds healing by primary closure. Cochrane Libr [Internet]. 2022; 4(4):CD009261. doi: 10.1002/14651858.cd009261.pub7

11. Santana-Romero C, Santiago-González N, Martínez-López Y, Antonio-Francisco N, Tortolero-Sánchez CR, González-Olivares DB, et al. Sistema de presión negativa como tratamiento de la ventana torácica: informe de un caso. Rev Enferm Neurol [Internet]. 2023;22(1):93-99. doi: 10.51422/ren.v22i1.416

12. Quilindo Giraldo CI, Ramirez Román JA, Martinez JP. Terapia de presión negativa como tratamiento alternativo en el manejo de una úlcera vascular arterial de miembros inferiores. Rev médica Risaralda [Internet]. 2020;26(1). doi: 10.22517/25395203.21271

13. de Castro Oliveira M, Andrade AYT de, Turrini RNT, Poveda V de B. Negative pressure wound therapy in the treatment of surgical site infection in cardiac surgery. Rev Bras Enferm [Internet]. 2020;73(5). doi: 10.1590/0034-7167-2019-0331

14. García-Montero A, Viedma-Contreras S, Martínez-Blanco N, Gombau-Baldrich Y, Guinot-Bachero J. Abordaje multidisciplinar de una dehiscencia abdominal infectada: evaluación coste-consecuente de apósitos y medidas utilizadas. Gerokomos [Internet]. 2018 [cited 2024 Nov 8];29(3):148-152. Available from: https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-928X2018000300148&lang=es

15. Andrade-Alegre R, Díaz A, Juárez H. Terapia de presión negativa para pacientes con enfisema subcutáneo y neumomediastino masivo. Revista Colombiana de Cirugía [Internet]. 2022;37(2):305-307. doi: 10.30944/20117582.932

16. Pontillo-Walerovsky M, Ferreira-Pozzi M, Wagner-Taustanowski G, Trostchansky-Vasconcellos I. Presión negativa como tratamiento de la exposición de la malla luego de una eventroplastia. Cir. parag. [Internet]. 2022 [cited 2024 Nov 8];46(1):32-35. doi: 10.18004/sopaci.2022.abril.32

17. Cervera-Simón M, Vila-Abad E. Comparativa entre cura en ambiente húmedo y terapia de presión negativa en lesiones por presión. Revisión bibliográfica. Gerokomos [Internet]. 2022 [cited 2024 Nov 6];33(4):263-268. Available from: https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-928X2022000400011&lang=es

18. Ibáñez Rodríguez B, Maestre Bernat L, Moya Martínez D, Bodro Marimont M, Hernández Carceny C. ¿Es posible la terapia de presión negativa en hospitalización a domicilio?: caso clínico. Gerokomos [Internet]. 2021 [cited 2024 Nov 9];32(2):136-139. Available from: https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-928X2021000200136&lang=es

19. García-Corral JR, Cárdenas-Lailson LE, Sanjuan-Martínez CA, Arellano-Solorio CH, Aquino-Matus JE, Carrillo-Romero A. Terapia de presión negativa combinada con tracción fascial mediante malla en el tratamiento de la necrosis pancreática infectada. Una

nueva opción terapéutica. Cir Cir [Internet]. 2019 [cited 2024 Nov 6];87(2):219-223. doi: 10.24875/ciru.18000472

20. Fuentes CF, Córdoba Guzmán AC, Daza Castro EM, Aponte D, González C, Sabbagh LC. Terapia E-VAC como tratamiento de complicaciones en cirugía gastrointestinal en centro de referencia de gastroenterología en Colombia: Serie de casos. Rev Gastroenterol Peru [Internet]. 2023 [cited 2024 Nov 8];43(2):e1472. doi: 10.47892/rgp.2023.432.1472

21. Sánchez ES. Abordaje herida compleja de difícil cicatrización mediante Terapia de Presión Negativa. Paraninfo Digital [Internet]. 2020 [cited 2024 Nov 6];(31):e3133. Available from: https://ciberindex.com/index.php/pd/article/view/2787

22. Monroy-Hernández D, López-Ugalde AC. Terapia de heridas con presión negativa en fascitis necrosante descendente de retrofaringe como sustituto al tratamiento quirúrgico convencional. An Orl Mex. [Internet]. 2023 [cited 2024 Nov 6];68(3):100-106. doi: 10.24245/aorl.v68i3.8677

23. Bermúdez A, Daroca T, García N, Martín M de LÁ, Vignau JM, Carmona C, et al. Impacto de la terapia de vacío en el tratamiento de las infecciones profundas y mediastinitis tras esternotomía media en los últimos 10 años. Cir Cardiovasc [Internet]. 2017;24(5):293-297. doi: 10.1016/j.circv.2016.11.054

24. González MF, Malagón HHO, Gerez ÁKP, et al. Uso de sistemas de cierre asistido al vacío (VAC) en heridas quirúrgicas infectadas en región cervicofacial (presentación de un caso clínico y revisión de la literatura). Rev Mex Cir Bucal Maxilofac. [Internet]. 2017 [cited 2024 Nov 8];13(2):40-50. Available from: https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=75582

25. Llamas Fernández S. Actualización de los resultados de la Terapia de Presión Negativa: Revisión Sistemática. Nure Inv. [Internet]. 2023 [cited 2024 Oct 11];20(112). doi: 10.58722/nure.v20i122.2340

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