REVISTA ENFERMAGEM ATUAL IN DERME

USE OF FIBRIN-RICH PLASMA IN THE TREATMENT OF PRESSURE INJURIES: AN INTEGRATIVE REVIEW

USO DE PLASMA RICO EN FIBRINA EN EL TRATAMIENTO DE LESIONES POR PRESIÓN: REVISIÓN INTEGRATIVA

USO DE PLASMA RICO EM FIBRINA NO TRATAMENTO DE LESÃO POR PRESSÃO: REVISÃO INTEGRATIVA

[1]Alane Clecia Tavares Silva Batista
[2]Laura Beatriz de Souza Bezerra
[3]Weslane Balbino de Macedo Lopes
[4]Ana Caroline Melo dos Santos

[1]Faculdade UNIRB Arapiraca, Arapiraca, Brazil. ORCID: https://orcid.org/0009-0009-7878-5171
[2]Faculdade UNIRB Arapiraca, Arapiraca, Brazil. ORCID: https://orcid.org/0009-0006-3966-3196.
[3]Faculdade UNIRB Arapiraca, Arapiraca, Brazil. ORCID: https://orcid.org/0009-0002-3757-7439
[4]Universidade Federal de Alagoas, Campus Arapiraca. Programa de Pós-Graduação em Enfermagem, Universidade Federal de Alagoas, Campus A.C Simões, Maceió, Brazil. ORCID: https://orcid.org/0000-0003-0280-6107.

Autor correspondente
Ana Caroline Melo dos Santos
Rua Guanabara, Bairro Capiatã – Arapiraca – AL – Brazil. CEP: 57310-105. phone: +55 (82) 99603-3197, E-mail: ana.santos@arapiraca.ufal.br

Submission: 18-08-2025
Approval: 26-01-2026

ABSTRACT
Introduction: The use of fibrin-rich plasma has been highlighted for its role in accelerating healing and tissue regeneration. **Objective:** To analyze the effectiveness of fibrin-rich plasma (FRP) in the treatment of pressure injuries. **Methods:** This is an integrative literature review conducted between August 23, 2023, and July 11, 2025, in the BVS, PubMed, Web of Science, Sciencedirect, Scopus, and Scielo databases. Studies published in the original article format conducted with humans who were treated with fibrin-rich plasma for pressure injuries were included, resulting in a sample of five articles. **Results:** Five original articles were selected for synthesis, from which it was possible to observe that the FRP technique provides greater safety to the patient because it is an autologous bioactive material, in addition to minimizing the risks of infection and reducing treatment time. **Conclusion:** This study found that adjuvant therapies, especially the FRP technique, emerge as a facilitating force in tissue healing and promoting quality of life. Nursing should be attentive to innovations in therapeutic options in order to provide better care and promote health.
Keywords: Pressure Ulcer. Platelet-Rich Fibrin. Nursing Care.

RESUMEN
Introducción: El uso del plasma rico en fibrina (PRF) se ha destacado por su papel en la aceleración de la cicatrización y la regeneración tisular. Objetivo: Analizar la eficacia del uso del PRF en el tratamiento de las lesiones por presión. **Métodos:** Se trata de una revisión integradora de la literatura, realizada entre agosto de 2023 y julio de 2025, en las bases de datos BVS, PubMed, *Web of Science*, *Sciencedirect*, *Scopus* y SciELO. Se incluyeron estudios publicados en formato de artículo original realizados con seres humanos que fueron tratados con PRF en el manejo de lesiones por presión. Resultados: Se seleccionaron cinco artículos originales para la síntesis, entre los cuales se observó que la técnica de PRF proporcionó mayor seguridad al paciente al tratarse de un material bioactivo autólogo, además de minimizar los riesgos de infección y disminuir el tiempo de tratamiento. **Conclusión:** Con el presente estudio, se observó que las terapias adyuvantes, en especial la técnica de PRF, surgen como una fuerza facilitadora en el recurso de cicatrización tisular y en la promoción de la calidad de vida. La enfermería debe estar atenta a las innovaciones en las opciones terapéuticas, con el fin de proporcionar una mejor asistencia y promover la salud.
Palabras clave: Úlcera por Presión; Fibrina Rica en Plaquetas; Cuidados de Enfermería.

RESUMO
Introdução: O uso de plasma rico em fibrina (PRF) tem se destacado pelo papel na aceleração da cicatrização e regeneração tecidual. **Objetivo:** analisar a eficácia no uso de plasma rico em fibrina no tratamento de lesão por pressão. **Métodos:** trata-se de uma revisão integrativa da literatura, realizada entre agosto de 2023 a julho de 2025, nas bases de dados BVS, PubMed, Web of Science, Sciencedirect, Scopus e Scielo. Foram incluídos estudos publicados no formato artigo original realizados com seres humanos que foram tratados com o plasma rico em fibrina no manejo de lesões por pressão. **Resultados:** foram selecionados cinco artigos originais para a síntese, dentre os quais foi possível observar que a técnica de PRF proporcionou maior segurança ao paciente por se tratar de um material bioativo autólogo, além de minimizar os riscos de infecção e diminuir o tempo de tratamento. **Conclusão:** com o presente estudo percebeu-se que as terapias adjuvantes, em especial a técnica de PRF, emergem como força facilitadora no recurso de cicatrização tecidual e na promoção da qualidade de vida. A enfermagem deve estar atenta às inovações em opções terapêuticas, com intuito de proporcionar uma melhor assistência e promover a saúde.
Palavras-chave: Úlcera por Pressão; Fibrina Rica em Plaquetas; Cuidados de Enfermagem.

REVISTA ENFERMAGEM ATUAL IN DERME

INTRODUCTION

Pressure injury (PI) is characterized as an injury located on the skin and/or underlying tissues, regularly caused by the strength applied to the affected region over a bony prominence resulting from prolonged pressure or related to some medical device or other artifacts. They are caused by the lack of blood flow, resulting in ischemia and tissue necrosis, and are common in bedridden patients or those with impaired mobility, thus being a relevant problem for health and prolonged care departments. It is classified into four stages that range from stage 1, skin hyperemia, to stage 4, when there is bone and muscle exposure[1].

PI represents a problem to public health departments that persists through the years, mainly in elderly patients who are hospitalized or in home care, impairing their quality of life both physically and emotionally, as well as their family members, in addition to increasing morbidity and mortality rates. Studies show that the prevalence in health units can reach up to 62% among institutionalized elders, highlighting the vulnerability of this population pertinent to the morbidity and mobility of these patients. This epidemiological data reinforces the importance of methods and precautions to prevent and intervene in these injuries[2-4].

Nursing care for patients with injury and wound protection involves several practices and constant monitoring to prevent worsening of this condition, including rigorous and continuous evaluation of skin integrity, adequate cleaning, proper dressing, pain control, promotion of healing, frequent repositioning, and use of mechanisms to prevent friction. Another key factor is educating patients and their families on their daily routine and changes in sleeping position[1].

In accordance with Law 7,498/86, which rules on the nursing practice in Brazil, the nurse has the private responsibility of performing detailed evaluations, prescribing specialized care, and coordinating treatment plans, with specialized, systematized, individual care, ensuring that interventions are evidence-based. Thus, the nursing category led by the nurse plays a crucial role in recovering and preventing the emergence of future injuries, promoting patient health and well-being, in accordance with the legislation[5].

In view of that, technologies have been studied to advance healing and reduce the negative impacts of these injuries. Among these technologies, we highlight fibrin-rich plasma (FRP), an advanced regenerative medicine technique that uses patients' blood components, obtained from blood centrifugation, transforming it into a platelet and growth factor-rich fibrin matrix to enable healing. Recent studies indicate that FRP can reduce recovery time for these patients and accelerate wound healing, thereby improving tissue regeneration[6].

Several studies have demonstrated the efficacy of FRP in regenerating several types of injuries, including pressure injuries, given that the blood components contained in FRP can

REVISTA ENFERMAGEM ATUAL IN DERME

promote angiogenesis, increase local immune response, and stimulate collagen production. Due to it being an autologous material, it has a low index of complications. According to the COREN-DF N. 011/CTA/2023 consolidated opinion, nurses are enabled to use this technique in the treatment of complex wounds, if they follow specific protocols to ensure treatment safety and efficacy[6,7].

Integral tissue injuries are caused by damage to the integrity of the skin and/or underlying tissues, especially in regions of greater bone prominence. Moreover, it can be associated with the long-term use of medical mechanisms, shearing, and/or prolonged pressure in a certain region. The elderly population is more prone to long-term hospitalizations due to complications of chronic pathologies, which, in turn, makes them the prime target for developing PI[8].

Adjuvant therapies have become more accessible every day, whether due to their cost-benefit or practicality, and one example is the fibrin-rich plasma technique (FRP). It is an autologous material that helps the organism adapt easily, in addition to considerably decreasing the possibility of infection since it is derived from a biological material specific to each patient. The nurse is the multiprofessional team member responsible for collecting, preparing, and applying this innovative therapy in an individualized and systematized fashion, to cater to the needs and particularities of each individual[6]. Thus, the objective of this review was to assess the utilization of fibrin-rich plasma (FRP) in the treatment of pressure injuries, analyzing its benefits in the healing and accelerated recovery of patients.

METHODS

This is an integrative literature review. This methodology aims to inclusively and systematically summarize the knowledge available on a certain technique. Literature review and systematic literature review include the analysis of experimental and empirical studies, offering a holistic and critical perspective on scientific evidence. An integrative literature review is essential to evaluate the consistency of results from different studies and propose new paths for future research[9].

Studies confirm that the PICO strategy is an instrument used in evidence-based practice to elaborate clear and targeted research questions, facilitating the search and analysis of results[10]. The authors have described the PICO strategy as an acronym corresponding to: Population (P), Intervention (I), Comparison (C), and Outcomes (O). Following this strategy, in this review, P stands for: Patients with pressure injuries; I: Use of fibrin-rich plasma; C: Compared to conventional dressing; O: Improvement in healing and healing time.

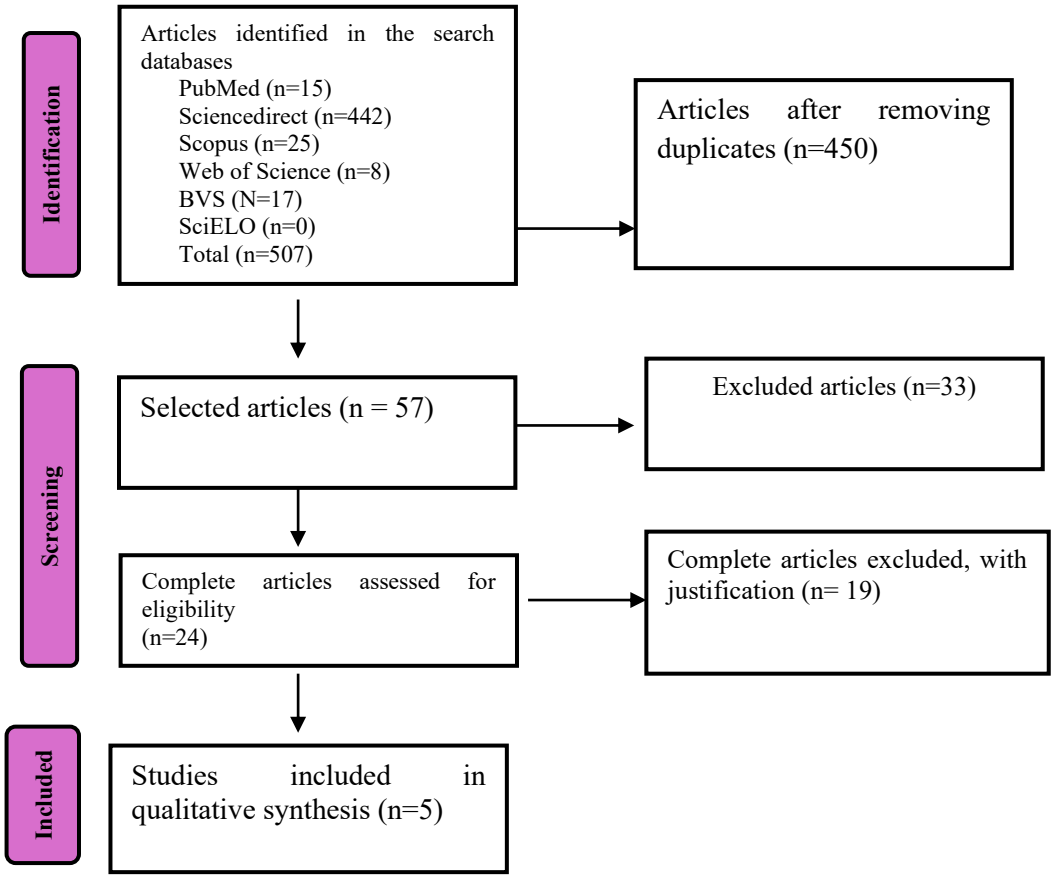
The following research question was formulated: How can the use of fibrin-rich plasma (FRP) interfere with the healing and recovery of patients with pressure injuries? The research was conducted in the following

REVISTA ENFERMAGEM ATUAL IN DERME

databases: *Biblioteca Virtual em Saúde* (BVS), PubMed/Medline, Web of Science, Sciencedirect, Scopus, and Scientific Electronic Library Online (Scielo), between August 2023 and July 2025. For all the searches we used descriptors in English and Portuguese: "plasma rico em fibrina", "plasm-rich fibrin"; "úlcera por pressão", "lesão por pressão" and "pressure ulcer", intermediated by Boolean operators AND and OR. The data analysis was conducted on the Parsifal software, which helped screen articles for inclusion or exclusion.

The inclusion criteria were articles in English and Portuguese, primary studies, studies that conducted original research with human beings, assessing the main theme of this review, and with no time frame delimitation. Secondary studies (narrative, integrative, and systematic reviews), gray literature (dissertations, theses, unpublished documents, conference reports, and/or scientific meetings), and articles that did not address the chosen theme were excluded. Data was collected using an organized instrument that contained authors' names, year, study objective, methodology, and main results. Figure 1 demonstrates the process of identification, screening, and inclusion of articles.

Figure 1 - Primary studies selection flowchart, adapted from the PRISMA* recommendation.



Source: Authors, 2025.
* Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

REVISTA ENFERMAGEM ATUAL IN DERME

RESULTS

From the results that addressed the theme, five original scientific articles were selected for integrative bibliographical review, which included studies with human beings that presented pressure injuries. Of those, three studies involved observational methodology, one was a cohort study, and one was a prospective study. The studies aimed to assess and describe how the FRP technique can be beneficial to the treatment of pressure injuries, due to its ability to promote faster healing, since platelets are mainly responsible for tissue recovery, accelerating the angiogenesis process. The included studies are summarized in Chart 1.

Chart 1 - Synthesis of the articles retrieved from the databases. Arapiraca, AL, Brazil, 2025.

Author, Year	Title	Objective	Methodology	Main Results
Pinto *et al.* [11].	Leukocyte- and platelet-rich fibrin (L-PRF) as a regenerative medicine strategy for the treatment of refractory leg ulcers: a prospective cohort study.	Explore and precisely quantify the adjuvant benefits of topical applications of L-PRF in the treatment of refractory leg ulcers in a diverse group of patients.	Prospective cohort study	All the wounds presented significant improvements with the use of L-PRF therapy and presented complete closure in the period of 3 months. In the five patients who interrupted therapy, it was possible to observe improvement in the injury size.
Yu *et al.* [12]	Use of autologous platelet rich fibrin-based bioactive membrane in pressure ulcer healing in rats.	To verify the viability of pressure ulcer treatment with platelet-rich fibrin-based bioactive membrane (PRF), both in vitro and in vivo.	Observational study	The study indicates that the bioactive FRP membrane promotes the healing of pressure ulcers in rats. Thus, it can represent a natural and effective tool for healing wounds in humans in the future.
Swarnakar	Platelet-Rich	To demonstrate the	Observational	Fibrin-rich plasma (FRP),

REVISTA ENFERMAGEM ATUAL IN DERME

et al. [13]	Fibrin Membrane- as a novel biomaterial for pressure injury healing in a person with spinal cord injury: A case report	efficacy of the method which addresses the healing of chronic pressure injuries, in addition to highlighting that FRP helps in tissue regeneration, angiogenesis, and infection prevention, leading to a collaborative impact in healing.	study	considered the second generation of platelet-rich plasma (PRP), has potential characteristics for healing wounds, being fairly promising in hard-to-heal skin ulcers.
Madhu *et al.* [14].	A Clinical Study of Efficacy of Autologous Platelet-Rich Fibrin (PRF) in Chronic Non-Healing Ulcers.	To determine the efficacy of autologous platelet-rich fibrin in chronic non-healing ulcers and compare the healing rate in different ulcers based on etiology.	Prospective study	This study shows that autologous therapy with platelet-rich fibrin promotes faster healing in chronic non-healing ulcers, with no adverse events.
Santos *et al.* [15].	Platelet-rich fibrin in the treatment of chronic injuries: a case study.	To analyze the healing process of a patient with a pressure injury using PRF as treatment.	Observational study	Growth factors derived from platelets are mainly responsible for tissue regeneration; therefore, the PRF technique is a safe, convenient, and easy-to-use adjuvant therapy with significant potential to heal chronic wounds with no adverse events.

Source: Elaborated by the authors (2025).

DISCUSSION

In the present study, we have identified that FRP favors granulation tissue growth and considerably reduces injury extension, confirming its efficacy in wound treatment. Such findings corroborate those from a previous

REVISTA ENFERMAGEM ATUAL IN DERME

systematic review study that concludes that a three-dimensional fibrin matrix present in this biomaterial creates a biochemical environment that favors tissue regeneration[16]. Given the complexity related to wound treatment, conventional therapies have limited efficacy, leading to the search for adjuvant therapies for promoting fast and effective regeneration. The present study addresses the fibrin-rich plasma technique as an innovative therapy that has demonstrated to be promising in the regeneration treatment of pressure injuries[15].

In a prospective study, FRP has proven superior to conventional treatments in the healing of pressure ulcers by facilitating the process through the release of growth factors that are essential in accelerating healing, and by the quality of regeneration evidenced during the evaluation of tissue evolution[14]. In a study that used an animal model with rats, the applied conventional treatment did not show the presence of fundamental biological components for ideal healing in due time. In contrast, FRP acted continuously in the production of platelet-derived endothelial and vascular growth factors[12].

FRP has been demonstrated to have antibacterial properties of clinical importance at an injury level. It was hypothesized that this technology worked as a physical barrier, protecting against damage caused by external contaminants and pathogens, limiting the chance of infections. Another factor emphasized by the author is less frequent dressing changes, which contribute to reducing treatment time and the need for invasive procedures, decreasing pain, and consequently improving patients' quality of life[14]. Moreover, there was a favorable cost-benefit in several aspects, including resource optimization, improvement in performance, and sustainability of the proposed intervention, which reinforces the viability of implementing the analyzed strategy into healthcare services.

For being an autologous product derived from the patient's own blood, it disregards associated costs and allogeneic materials and even synthetic materials, limiting adverse reactions. FRP demonstrated a great advantage to health costs, leading to shorter professional visits and not requiring additional treatments, which represents a relevant economy for both health departments and patients[17].

The nurse working in wound treatment is supported by the COFEN resolution N. 567/2018, which addresses scientific evidence-based practice. Within those criteria, this biomaterial arises as an innovative treatment for the regeneration of complex wounds, in which nursing plays a crucial role in assessing patients with these injuries. Moreover, it is the nursing team's responsibility to provide information on the procedure regarding its potential risks and benefits, mainly to those patients who have already been treated with conventional protocol unsuccessfully, ensuring they understand and agree with the therapeutic plan[18,14].

The COFEN resolution N. 736/2024 underscores the nurse's responsibility in

REVISTA ENFERMAGEM ATUAL IN DERME

assisting this patient by creating a systematized and individualized care method. A holistic perspective from the professional is key to caring for this individual in several aspects. Thus, care goes beyond the physical treatment of the wound; it encompasses the emotional and social state of the patient, promoting quality of life and well-being, helping them deal with the physical and psychological challenges associated with those injuries. These elements are crucial to optimize results and ensure effective FRP treatment for patients[14,19].

The literature has highlighted a great potential in the reduction of complications associated with PI, pointing to it as a promising technology in comparison to conventional treatments. However, some important limitations, such as the reduced number of clinical studies, language, and variability of FRP usage protocols, have been identified. Another limitation is the volume of autologous material collected from the patient, which must be done safely and in a single session, and might not be enough to treat large injuries.

Within the possibilities of using the FRP biomaterial, the results provide a weak experimental basis, and there is an emerging need for future clinical applications of autologous bioactive membranes in humans, with the development of randomized clinical trials comparing it with other conventional treatment methods to strengthen the evidence-based practice and insertion into clinical protocols and programs.

CONCLUSION

We conclude that FRP is presented as a promising technology for treating pressure injuries by demonstrating significant potential in accelerating the healing process, improving the quality of tissue regeneration, and reducing complications associated with conventional therapies. The use of this material can be an innovative and potentially transformative strategy in the care of complex wounds, with a direct impact on the quality of care, patient safety, and resource optimization in healthcare.

REFERENCES

1. Campos MGCA, Sousa ATO de, Vasconcelos JMB, Lucena SAP de, Gomes SKA. Feridas complexas e estomias: aspectos preventivos e manejo clínico. João Pessoa (PB): Ideia; 2016.

2. Bastos IWRM, Costa LFM, Ferreira MFA, Carvalho LWT, Zimpel SA, Alves PGJM, et al. Perfil clínico e epidemiológico de pacientes com lesão por pressão: estudo comparativo entre hospital público e privado. Research, Society and Development. 2021; 10(4):e18010413176. DOI: http://dx.doi.org/10.33448/rsd-v10i4.13176

3. Machado DO, Mahmud SJ, Coelho RP, Cecconi CO, Jardim GS, Paskulin LMG. Cicatrização de lesões por pressão em pacientes acompanhados por um serviço de atenção domiciliar. Texto Contexto Enferm. 2018;27(2):e5180016. DOI: https://doi.org/10.1590/0104-07072018005180016

4. Silva DVA, Carmo JR do, Cruz MEA, Rodrigues CAO, Santana ET, Araújo DD de. Caracterização clínica e epidemiológica de pacientes atendidos por um programa público de atenção domiciliar. Enferm. foco. 2019; 10(3):112-18. DOI:

https://dx.doi.org/10.21675/2357-707X.2019.v10.n3.1905

5. Brasil. Presidência da República**.** Lei nº 7.498, de 25 de junho de 1986. Dispõe sobre a regulamentação do exercício da enfermagem e dá outras providências [Internet]. Brasília-DF: Diário Oficial da União; 1986 [cited 2023 Aug 23]. Available from: https://www.planalto.gov.br/ccivil_03/leis/l7498.htm

6. Freitas LGR de. Plasma Rico em Fibrina: Revisão de Literatura [monografia]. Sete Lagoas (MG): Faculdade FACSETE; 2021.

7. Conselho Regional de Enfermagem. Parecer técnico COREN-DF n° 011/2023. O uso da Matriz de Fibrina Leucoplaquetária Autóloga (FLA) não transfusional no tratamento de feridas complexas por Enfermeiros [Internet]. Brasília-DF: COREN-DF; 2023 [cited 2023 Aug 29]. Available from: https://coren-df.gov.br/wp-content/uploads/2023/08/PT-011_23-MATRIZ-DE-FIBRINA-FINAL_Rinaldo.pdf

8. Campos MGCA, Campos SCTS, Abreu AM de, Geovanini T, Nagashima AMS, Vasconcelos JMB. Tratado de feridas e curativos – Uma Abordagem Teórica e Prática. João Pessoa (PB): Brasileiros & Passos; 2022.

9. Brizola J, Fantin N. Revisão de literatura e revisão sistemática de literatura. RELVA. 2016; 3(2):23-39. DOI: https://doi.org/10.30681/relva.v3i2.1738

10. Santos CMC, Pimenta CAM, Nobre MRC. The PICO strategy for the research question construction and evidence search. Rev Latino-am. Enfermagem. 2007;15(3):508–11. DOI: https://doi.org/10.1590/S0104-11692007000300023

11. Pinto NR., Ubilla M, Zamora Y, Del Rio V, Dohan Ehrenfest DM, Quirynen M. Leucocyte- and platelet-rich fibrin (L-PRF) as a regenerative medicine strategy for the treatment of refractory leg ulcers: a prospective cohort study. Platelets.2017; 29(5):468–75. DOI: https://doi.org/10.1080/09537104.2017.1327654

12. Yu Y, Shen J, Fang L, Wang L, Lei S, Cai D, et al. Use of autologous platelet rich fibrin-based bioactive membrane in pressure ulcer healing in rats. JWC. 2019;28(4). DOI: https://doi.org/10.12968/jowc.2019.28.sup4.s23

13. Swarnakar R, Rahman H, Venkataraman S. Platelet-Rich Fibrin Membrane-as a novel biomaterial for pressure injury healing in a person with spinal cord injury: A case report. Spinal Cord Ser Cases. 2022; 8(1):75. DOI: https://doi.org/10.1038/s41394-022-00540-8

14. Madhu M, Hulmani M, Naveen Kumar AC, Kumar VJ. A Clinical Study of Efficacy of Autologous Platelet-Rich Fibrin (PRF) in Chronic Non-Healing Ulcers. Indian J Dermatol. 2022; 67(6):834. DOI: https://doi.org/10.4103/ijd.ijd_204_22

15. Santos WAO, Kreling MCGD, Baricati CCA, Yagi MCN, Karino ME. Fibrina rica em plaquetas no tratamento de lesões crônicas: um estudo de caso. Rev. Feridas. 2023;11. DOI: https://doi.org/10.36489/feridas.2023v11i59p2164-2169

16. Napit IB. et al. Autologous blood products: Leucocyte and Platelets Rich Fibrin (L-PRF) and Platelets Rich Plasma (PRP) gel to promote cutaneous ulcer healing - a systematic review. BMJ open. 2023; 13(12): e073209. DOI: https://doi.org/10.1136/bmjopen-2023-073209

17. Gole PV, Muhammed N, Patadia SR. Efficacy of autologous platelet rich fibrin matrix in the management of non-healing ulcers. Int J Res Dermatol. 2019;5(4):686-90. DOI: https://doi.org/10.18203/issn.2455-4529.IntJResDermatol20194566

18. Conselho Federal de Enfermagem. Resolução nº. 567/2018. Regulamenta a atuação de equipes de enfermagem no cuidado aos pacientes com feridas [Internet]. Brasília-DF: COFEN; 2018 [cited 2023 Sep 17]. Available from: https://www.cofen.gov.br/wp-content/uploads/2018/02/RESOLU%C3%87%C3%83O-567-2018.pdf

19. Conselho Federal de Enfermagem. Resolução nº 736/2024. Dispõe sobre a implementação do Processo de Enfermagem em todo contexto socioambiental onde ocorre o cuidado de enfermagem [Internet]. Brasília-DF: COFEN; 2024 [cited 2023 Sep 17]. Available from: https://www.cofen.gov.br/resolucao-cofen-no-736-de-17-de-janeiro-de-2024/

Funding and Acknowledgments:

Nothing to declare.

Conflict of Interest Statement

Nothing to declare.

Authorship Criteria (Author Contributions)

Authorship designation should be based on ICMJE guidelines, which consider an author to be someone who:

1. contributes substantially to the conception and/or planning of the study: Alane Clecia Tavares Silva Batista; Ana Caroline Melo dos Santos.

2. contributes to the acquisition, analysis, and/or interpretation of the data: Alane Clecia Tavares Silva Batista; Laura Beatriz de Souza Bezerra; Weslane Balbino de Macedo Lopes; Ana Caroline Melo dos Santos.

3. contributes to the drafting and/or critical review and final approval of the published version: Alane Clecia Tavares Silva Batista; Laura Beatriz de Souza Bezerra; Weslane Balbino de Macedo Lopes; Ana Caroline Melo dos Santos.

Data Availability Statement

No databases were generated in this study. The information presented is described in the body of the article.

Scientific Editor: Ítalo Arão Pereira Ribeiro.
Orcid: https://orcid.org/0000-0003-0778-1447