

***NEGATIVE-PRESSURE WOUND THERAPY IN A PATIENT WITH PRESSURE ULCER  
AND COVID-19: CASE REPORT***

**TERAPIA POR PRESSÃO NEGATIVA EM PACIENTE COM LESÃO POR PRESSÃO E COVID-  
19: RELATO DE CASO**

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**ABSTRACT**

**Objective:** to report a clinical case of a patient with pressure ulcer affected by COVID-19 submitted to Negative-Pressure Wound Therapy. **Method:** this is a qualitative case report study. Data collection took place from January to March 2021 using electronic medical records. The participant was an adult and diabetic patient, affected by COVID-19. He developed a complex and extensive pressure lesion in the gluteal region treated with Negative-Pressure Wound Therapy, and was hospitalized for five months in a referral hospital for COVID-19 treatment, in southern Brazil. **Results:** the pressure ulcer was of an indeterminate degree in a sacral region of great extension and was permeated by yellowish necrosis tissue, adhered to the lesion layer, with a large amount of exudate and a foul odor. Negative-Pressure Wound Therapy was used for one month, being withdrawn at hospital discharge. Afterward, the use of calcium alginate with silver was started, and in a few months, the lesion showed a significant decrease. **Final considerations:** the effectiveness of Negative-Pressure Wound Therapy for pressure ulcer in the study patient with COVID-19 was observed. It is important to highlight the importance of the multidisciplinary group and of a well-developed follow-up after discharge, which contributed to the positive outcome for the case.

**Keywords:** Pressure Ulcer; Negative-Pressure Wound Therapy; Coronavirus Infections; Patient Care Team; Nursing.

**RESUMO**

**Objetivo:** relatar um caso clínico de um paciente com lesão por pressão acometido pela COVID-19 submetido à terapia por pressão negativa. **Método:** trata-se de um estudo qualitativo do tipo relato de caso. A coleta de dados ocorreu no período de janeiro a março de 2021 em prontuário eletrônico. Foi convidado a participar um paciente adulto, diabético, acometido pela COVID-19, que desenvolveu uma lesão por pressão complexa e extensa em região glútea tratada com a terapia por pressão negativa, e que esteve internado por cinco meses em um hospital de referência para tratamento da COVID-19 no sul do Brasil.

**Resultados:** a lesão por pressão era de grau indeterminado em região sacra de grande extensão e encontrava-se permeada por tecido de necrose de coloração amarelada, aderido ao leito da lesão, com grande quantidade de exsudato e odor fétido. A terapia por pressão negativa foi utilizada por um mês, sendo retirada na alta hospitalar. Após, foi dado início à utilização de alginato de cálcio com prata, e em poucos meses a lesão apresentou significativa diminuição. **Considerações finais:** observou-se a eficácia da terapia por pressão negativa no tratamento de lesão por pressão no paciente do estudo com COVID-19. É importante ressaltar a importância da avaliação do grupo multiprofissional e de um seguimento bem elaborado após a alta, o que colaborou com o desfecho positivo para o caso.

**Palavras-chave:** Lesão por Pressão; Tratamento de Ferimentos com Pressão Negativa; Infecções por Coronavirus; Equipe de Assistência ao Paciente; Enfermagem.

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## INTRODUCTION

The new coronavirus disease (COVID-19) is a highly infectious disease caused by coronavirus 2 (SARS-CoV-2), and was first reported in Wuhan, Hubei province, China, and quickly spread to other Chinese cities, reaching other countries<sup>(1)</sup>. On January 30th, 2020, the World Health Organization (WHO) declared this ongoing outbreak as a global public health emergency and raised the risk of COVID-19 to very high on February 28th, 2020, declaring a pandemic state in March 2020<sup>(2)</sup>.

Due to a large number of patients in intensive care beds due to complications of COVID-19, mostly bedridden, with tissue hypoxia, nutritional deficit, and prolonged hospitalizations, there was a significant increase in the incidence of pressure ulcers (PU)<sup>(3)</sup>.

As established by the National Pressure Ulcer Advisory Panel (NPUAP), pressure ulcers are defined as localized damage to the underlying skin and soft tissue, usually on bone prominence, or related to the use of a medical device. They can occur as a result of intense and prolonged pressure or pressure combined with shear and may appear on intact skin or as an open ulcer, and be painful<sup>(4)</sup>. When they appear, they are harmful and lead to clinical complications, which can be a predictive factor for an unfavorable prognosis. In these cases, nursing and multi-

professional care is essential for complete patient rehabilitation<sup>(5)</sup>.

When it occurs, some treatments can be used for the recovery of fragile and damaged skin. One of them is negative pressure wound therapy (NPWT)<sup>(6)</sup>, which has been widely publicized over the past 15 years, assists in the healing of complex wounds by applying negative pressure under the extent of the ulcer. The vacuum mechanism accelerates wound healing by promoting the formation of granulated tissue, collagen, fibroblasts, and inflammatory cells, improving the wound so it can receive a graft. It is also indicated for supposedly irreversible injuries, for those that have great extension and depth, constituting more complex injuries when comparing to other types of wounds<sup>(7)</sup>.

Thus, given the current pandemic situation in Brazil and worldwide, and the data previously brought about critically affected people by COVID-19, the relevance of the accomplishment and publication of this case report is found. Furthermore, the interest in the development of this work is due to the fact that, to the best of the authors' knowledge, there is no study that has related the use of negative pressure wound therapy in patients with complex, wide PU, without the possibility of a surgical approach due to clinical instability due to COVID-19.

In addition, it is believed that the data in this case report may foster and subsidize

nursing care and other health professionals in the treatment of patients with PU. In the same way, it may help those who have COVID-19 and PU, possibly very similar to that of the studied patient.

Therefore, the objective of this study is to report a clinical case of a patient with a pressure ulcer affected by COVID-19 and submitted to negative pressure wound therapy.

## METHOD

This is a qualitative and case report study, which was written based on the Case Report Guidelines<sup>(8)</sup>. This type of study is defined as an empirical investigation, focused on contemporary phenomena selected to provide in-depth descriptions of its fundamental dimensions and processes. The phenomena can be group, individual, social or organizational, and its purpose is to describe real-life contexts, seek explanations and investigate units of analysis<sup>(9)</sup>.

Data collection took place from January to March 2021. An adult and diabetic patient, affected by COVID-19, who developed a complex and extensive pressure lesion in the gluteal region treated with a NPWT, was invited to participate. He was hospitalized for five months in a referral hospital for the treatment of COVID-19 in southern Brazil.

In the case of patients who develop pressure ulcers at the hospital level, the Hospital's Skin Ulcers Prevention Commission is activated for an interdisciplinary evaluation in search of the definition of the best conduct to be adopted in the treatment of PU.

The Commission has 21 members and has 250 monthly consultations. The outpatient care of the Skin Ulcer Prevention Commission for patients with ulcers occurs every day and has a stoma nurse, and other members, such as nurses, nutritionists, psychologists, social workers, clinical doctors, plastic surgeons, and others when necessary.

In the evolution of the case, the stoma nurse and the doctor responsible for the clinical follow-up of the patient participated. Also, the patient was assisted by a multi-professional team throughout the hospital stay.

It is important to emphasize that the photos present in this paper were previously authorized by the patient and his family caregiver, and preserve the participant's identity. The images are shown due to the interest and importance of monitoring and progressing the studied pressure ulcer, for comparison purposes.

This report received the approval of the Research Ethics Committee by opinion number 4.608.128 and CAAE number

44558221.4.0000.0098. The study participant signed the Informed Consent Form (ICF), and all procedures complied with Resolution number 466/2012 of the Brazilian Ministry of Health<sup>(10)</sup>.

After explaining the study to the patient and his family caregiver, and the patient's consent process, clinical information was searched and data were collected from the patient's electronic medical record, which was transcribed in a Word document.

## RESULTS

This study describes the clinical case of a 49-year-old male patient, married, two children, unemployed, with type II Mellitus Diabetes. He reported the onset of symptoms indicative of COVID-19 on 07/13/2020, with a positive test result (PCR-RT test) on 07/29/2020. Over the period, he evolved with rapid clinical deterioration and sought medical help. On 07/25/2020, he was admitted to a referral field hospital for the treatment of COVID-19 in southern Brazil.

On the day of his hospital admission, he presented Severe Acute Respiratory Distress Syndrome (ARDS) with refractory hypoxemia and acute dialysis renal failure (07/31/2020 and 08/17/2020), with the need for orotracheal intubation and transfer to the Intensive Care Unit (ICU) for advanced support. He underwent renal replacement therapy and was pronated at different times as

part of the care. On 08/15/2020, when he failed extubation, he underwent a tracheostomy.

He used Astro and Tamiflu before hospitalization, Tazocin from 29/07/2020 to 08/05/2020, Vancomycin and Meronem from 08/18/2020 to 08/23/2020 by tranqueobronchitis, Meronem from 17 to 27/09/2020 due to pressure ulcer and polyneuropathy of a critically ill patient, followed by colonization by *Klebsiella pneumoniae* (KPC) and Vancomycin-resistant *Enterococcus* (VRE). On 10/10/2020, a protective loop colostomy was performed to bypass the digestive tract, in order to protect the ulcer in the sacral region, already infected, and on 10/16/2020, treatment for *Pseudomonas aeruginosa* sensitive to Amicilon was started, as well as methicillin-resistant *Staphylococcus aureus* (MRSA), sensitive to Bactrim. He used Amikacin and Bactrim from 10/19/2020 to 10/26/2020 for hospital pneumonia. In November 2020, he presented multisensitive *Escherichia coli* and *Pseudomonas aeruginosa* sensitive to Fortaz.

In relation to the laboratory tests, during hospitalization, he presented hemoglobin of 8.8 g / dL, and an increase in leukocytes up to 16,000  $\mu$ L., Plateletocytosis of up to 491,000  $\mu$ L. 8g / dL, with an increase to 3.2g / dL on the date of hospital discharge. In urine culture on 11/09/2020, he presented multisensitive *Pseudomonas aeruginosa*.

Regarding chest CT scans, on 10/18/2020, there was a small increase in the area of consolidation in the lower lobe of the left lung, compared to 9/21/2020, as well as worsening of the breathing pattern, added a picture of delirium.

On 11/26/2020, he was discharged from the hospital, showing good general condition, being lucid, oriented in time and space, flushed, hydrated, anicteric, acyanotic, axillary temperature 97.16°F, capillary glycemia of 131mg / dL, diuresis present with 1200 ml of total volume, Glasgow Coma Scale 15, isochoric and photoreagent pupils, received a pasty oral diet with good acceptance, strength in lower limbs four, and upper limbs in three proximal; a distal; left upper limb distal zero and proximal two. He showed no signs of respiratory distress, with a respiratory rate of 17/19 respiratory movements per minute and an oscillating saturation of 92 to 97%. Systolic blood pressure of 100-120 and diastolic of 60-78mmHg, heart rate of 72-113 beats per minute, non-engorged jugulars, and heated extremities.

On physical examination, he presented a flat, flaccid abdomen, hydro-air noises present, painless palpation, diuresis in a bladder catheter with no lumps, colostomy on the right lower flank, with brownish pasty

stools, lower limbs without edema or swelling of the calves. In addition, the patient presented disproportionate tetraparesis, with predominance in the upper limbs, with worsening on the left (likely bilateral brachial plexus injury) and neuropathy and myopathy of the critically ill patient.

As for the evolution of the pressure ulcer, on 05/10/2020, the first evaluation of the Skin Ulcer Prevention Committee took place. It was of indeterminate degree in a sacral region of great extension, 14 x 10 x 2 cm in depth. The lesion was permeated by yellowish necrosis tissue and adhered to the lesion in 50%. The exudate had a large amount of serous color, as well as a fetid odor, grade I, and a moderate amount of blood. The edges were adhered to the bed, irregular, and macerated at the top and side of the ulcer. Cleaning was performed with 0.9% saline, gauze, rayon, the hydrogel was prescribed twice a day, and occluded with a secondary dressing. The guidelines for the day were to change the secondary dressing whenever saturated, to keep a special dressing on the ulcer, patient repositioning every two hours, body hydration, comfort measures on bony extremities, full air mattress, and sheets well stretched.

It is possible to observe the evolution of the pressure ulcer in figure 1.

**Figure 1 – Evolution of the pressure ulcer from the first evolution of the Skin Ulcer Prevention Committee until the last evaluation. Curitiba, Paraná, Brazil, 2020 - 2021.**



**Source:** the authors.

It is important to highlight that UP debridement was performed in six days throughout the treatment, before NPWT, since on 10/05/2020 there was 50% necrosis and yellowish tissue adhered to the lesion, and on 10/20/2020 this percentage dropped to 20% (decrease attributed to the use of daily hydrogel and debridement, as well as the use of antibiotics such as Amikacin and Bactrim, patient repositioning, full air mattress and stretched sheets). In addition, on 10/10/2020, a protective loop colostomy was performed to bypass the digestive tract, which was essential to protect the lesion in the sacral region, which was already infected. Moreover, after the removal of NPWT, there was an increase

in granulation tissue of 80 to 90% in less than two weeks.

On 10/22/2020, NPWT was installed, which was used until 11/26/2020 (change of NPWT installation every four days), at the time of hospital discharge, having drained a total of 4250ml of exudate serous. It is noteworthy that after the patient's discharge, calcium alginate with silver was used, and in three months, the ulcer decreased from 14 x 10 x 2 cm in depth to 7 x 3 x 0 cm, and on 01/27/2021 a new debridement and dressing with calcium alginate with silver was performed.

On 02/22/2021, the patient had a grade II pressure ulcer about 1 cm x 4.5 cm in the sacral region. On 03/24/2021, the patient

maintained the ulcer in grade II, yet with 0.5 cm x 2.5 cm. The lesion was debrided on both visits, with bleeding characteristics, 100% granulation tissue, exudate in small quantities, and grade I odor. On both visits, a special silver foam dressing was performed after debridement.

In addition, it is important to highlight that, throughout the treatment, guidance was provided to the nursing team and family members, regarding the repositioning every two hours, the application of body hydration, comfort measures in bone extremities, maintaining the mattress of properly filled air and sheets and sleepers well stretched.

## DISCUSSION

In what concerns the participant's sociodemographic and clinical data, it corroborates to the literature, which shows that pressure ulcers are more present in patients with a long period of hospitalization and immobility. Moreover, the sacral region is the most frequent location, and the diagnosis of Mellitus diabetes contributes to the development of ulcers, such as the case of the patient <sup>(11)</sup>. Likewise, the infection and worsening of COVID-19 led the patient to a clinical condition that is difficult to manage, and consequently to the development of the pressure ulcer. Study shows that these injuries can prolong hospital stay due to the risk of

infections, and increased use of medications, as well as clinical complications<sup>(12)</sup>.

Furthermore, and corroborating with the aforementioned characteristics, the laboratory exams of the studied patient were also altered. Although some studies do not show a direct relationship between pressure ulcers and laboratory tests, it is known that anemia affects oxygen transport and its effect on the immune system leads to decreased resistance and infection, which can favor the development of PU<sup>(13)</sup>. In contrast, a more recent case-control study brought anemia, thrombocytopenia, thrombosis, the need for ventilatory and hemodialysis support, and malnutrition as factors associated with the development of PU<sup>(14)</sup>.

Regarding the latter, the patient had nutritional changes that demanded attention. It was necessary to promote the balance of the patient's nutritional needs, essential for faster healing. This is because nutritional intervention is an integral part of the treatment, since the use of certain nutrients can positively interfere in the healing process. The patient in this study used supplementation, which improves nutritional status, biochemical tests, and the Braden scale score. Furthermore, diet therapy directed to the treatment of PU causes a reduction in the depth, the serous exudate, and an increase in granulation tissue, in addition to helping to decrease bacterial infection<sup>(15)</sup>.

Given the clinical, nutritional, and laboratory changes, and the development of PU in the sacral region, NPWT was used after hydrogel ointment. The treatment proved to be effective in the PU, as it provides better subsidies for the epithelialization process, decreasing the odor, the devitalization of tissues, and local pain, which favors and promotes the healing process<sup>(16)</sup>. Additionally, debridements were carried out helped in the process of revitalizing lifeless tissue, boosting healing<sup>(14)</sup>.

After that, and from the moment when the lesion was more epithelialized, it was possible to use NPWT. Studies show its effectiveness in highly complex lesions, such as the patient in this study, highly infected and difficult to heal<sup>(17)</sup>. Furthermore, the use of NPWT proved to be favorable in reducing treatment time and hospital stay in patients with contaminated or infected complex wounds<sup>(18)</sup>.

When using NPWT on wounds, significant shrinkage of the wound can be observed as the edges of the wound come together by negative pressure applied to a foam. At the wound interface, the foam creates microdeformations that stretch the cells in the wound and activate the molecular pathways for cell migration, proliferation, and angiogenesis. It also removes a large amount of exudate or fluid, resulting in decreased tissue edema. In addition, a semi-occlusive

film covering the wound reduces contamination of external bacteria and provides a closed, moist, and warm environment for healing, reducing cell death caused by dehydration. Furthermore, NPWT has the advantage of requiring replacement only every two to three days, reducing the number of dressing changes for patients<sup>(19)</sup>.

Similarly, the chosen therapy has better efficacy and greater benefits for the patient, such as reduced exudate, edema, pain, and infections; rapid healing; more satisfactory angiogenesis, and the presence of a suitable bed for healing. Thus, it constitutes a therapeutic resource of great value for reducing treatment time and dressing changes, to offer greater comfort to the patient<sup>(6)</sup>.

In addition, there are studies in the literature that prove the efficacy and the benefit of using NPWT in complex lesions before surgical procedures. Nevertheless, this procedure was not performed on the studied patient, since he had an unstable condition due to COVID-19, which made a surgical approach impossible, proving its effectiveness even in situations where there is no surgical possibility<sup>(7,20)</sup>. Furthermore, despite being a type of dressing with high cost, it offers a better cost-benefit ratio, due to reductions of up to 15 times in the number of changes and its effectiveness in the epithelialization of lesions<sup>(6)</sup>.



## FINAL CONSIDERATIONS

This case report described the use of negative pressure wound therapy as an alternative in the treatment of pressure ulcers in patients with COVID-19. Thus, according to the information collected in this case report and the data brought by the literature, it is observed the effectiveness of negative pressure wound therapy in the treatment of PU, including in patients diagnosed with COVID-19 who have developed complex and extensive lesions, of difficult to heal and with no surgical approach.

The importance of an evaluation by the multi-professional group of the skin ulcer prevention committee and a well-elaborated follow-up is also emphasized. This approach led to a positive outcome for the patient. However, it is understood that this is only a case report and has its limitations in the methodological context. Thus, studies in the area should be encouraged in order to understand and produce more scientific evidence on the use of NPWT in injuries, not only due to pressure but in other scenarios.

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