

# Enhanced Negative Pressure Wound Therapy Shortens Hospital Stay for Major Burn Patients: Case Series

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**Summary:** The length of hospital stay (LOS) serves as a key metric for forecasting resource allocation and assessing quality of care in burn treatment. Negative pressure wound therapy with instillation and dwell time (NPWTi-d) has emerged as a groundbreaking option in the management of burns, linked to quicker wound healing and more effective infection resolution. However, its impact on LOS remains uncertain. This article introduces a series of burn injuries managed with NPWTi-d, using the Solventum V.A.C. Veraflo Cleanse Choice Dressing. Severely burned patients with deep burns were selected for treatment with NPWTi-d using Solventum V.A.C. Veraflo Cleanse Choice Dressing and were treated after skin grafts with Solventum V.A.C. Granufoam Dressing. We calculated the predictive LOS, with the formulas developed by Taylor et al and compared them with the actual LOS. NPWTi-d was administered to three patients. The age of the patients ranged from 16 to 42 years, with an average of 28.6 years (SD, 10.84) and an average total burn area of 48.16% (SD, 1.4%). We observed an average reduction in hospital stay of 23.2% (SD, 19.83%). All burn injuries either healed completely or demonstrated adequate skin graft survival and recovery in follow-ups. All the patients exhibited a decrease in the LOS, despite experiencing systemic complications arising from distributive shock. (*Plast Reconstr Surg Glob Open* 2024; 12:e6041; doi: [10.1097/GOX.0000000000006041](https://doi.org/10.1097/GOX.0000000000006041); Published online 7 August 2024.)

Globally, in 2019, a total of 8,955,228 new burn patients were recorded.<sup>1</sup> As a complex medical condition, the length of hospital stay (LOS) is used as a predictor of resource allocation and as an indicator of the quality of care.<sup>2</sup> Traditionally, the estimation of burn LOS was based on a simple metric: one day of hospitalization for each percentage of the body burned. However, Taylor et al introduced predictive models for estimating the LOS that account for patients above and below 40 years of age and differentiate cases with the presence of inhalation injury.<sup>2</sup>

A primary objective in burn treatment is to enhance wound care and minimize the LOS.<sup>3</sup> Negative pressure

wound therapy with instillation and dwell time (NPWTi-d) has emerged as a cutting-edge option in burn management. NPWTi-d uses reticulated open-cell foam, which boasts greater tensile strength and less hydrophobic properties compared with traditional dressings in negative pressure wound therapy (NPWT). This foam expands during the instillation of wound solution and following a set duration, negative pressure is reapplied to remove dissolved slough and other debris.<sup>4</sup> Its application has been linked to accelerated wound healing and faster clearance of infections.<sup>4</sup>

Specifically, the use of NPWTi-d in burns and its impact on the LOS has been scarcely described in the literature.<sup>5,6</sup> We present a case series of burn injuries treated with NPWTi-d.

## PATIENTS AND METHODS

Severely burned patients with deep burns were selected for NPWTi-d using Solventum V.A.C. Veraflo Cleanse

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Choice Dressing and were treated after skin grafts with NPWT with Solventum V.A.C. Granufoam Dressing.

After debridement and identification of the deepest burn wound zone, the contact layer and the thinnest cover layer were placed. Subsequently, the entire burn area was draped, extending coverage approximately 2cm beyond intact skin. V.A.C VeraFlo therapy is initiated, setting a cycle frequency of 2.5 hours at a negative pressure of -25mm Hg, coupled with a dwell time of 20 minutes with 20–30 mL of saline for instillation, adjusting the volume as necessary based on the extension of the area.

After 6 days, upon clear demarcation of the full-thickness burn, debridement and skin graft placement takes place. A soft gauze is used as an interface between the foam and the grafts, and NPWT is set to a continuous pressure of -100mm Hg. Four days later, integration of skin grafts is assessed. The number of procedures required varies among patients, depending on the extent of the burn area and any complications that may arise.

We calculated the predicted LOS, using the formulas developed by Taylor et al,<sup>2</sup> and these predictions were compared with the actual LOS.

### CASE SERIES

In the video, we present three major burn patients successfully treated with NPWT-id in the acute burn phase and then reconstructed with skin grafts and bolstered with conventional NPWT. [See Video (online), which displays three major burn patients treated with NPWT-id.]

### RESULTS

NPWTi-d was applied in three patients (Table 1). The ages of these patients ranged from 16 to 42 years, with an average 28.6 years (SD, 10.84). The average total burn area was 48.16% (SD, 1.4%), and an average reduction in the LOS of 23.2% (SD, 19.83%) was observed (Table 1). All burn injuries healed or had adequate skin graft survival. No patient had complications directly derived from the use of NPWTi-d or NPWT. Two had complications derived from distributive shock. All patients were assessed on follow-up appointments with adequate recovery.

### DISCUSSION

Efficient wound care significantly influences the LOS. According to a worldwide survey, most respondents believe that selecting the appropriate wound dressing can reduce the duration of LOS and costs.<sup>3</sup>

Among wound care options, NPWT stands out as an innovative approach that has been linked to improvements in several key areas: reductions in the time required for wound healing and granulation tissue development, LOS, wound size, and the time needed for wound closure in injuries of diverse etiologies.<sup>4</sup> The addition of instillation and subsequent removal of a topical solution further aids in diluting and dissolving wound debris.<sup>7</sup> A historical cohort study highlighted that patients treated with NPWTi-d experienced fewer surgical debridements, reduced LOS, less painful dressing changes, and quicker wound closure compared with those treated with standard

Table 1. Patient Information, Variable Title (Mean, SD)

Case No.	Sex	Age (28.6, 10.84)	Burn Type	Total Burn Surface Area (48.16%, 1.4%)	Burn Location	NPWTi-d Location	Grade	Inhalation Injury	Comorbidities	Complications	Procedure Number (8, 4.32)	Predictive LOS in Days (57.5, 10.7)	LOS in Days (46, 19.5)	Hospital Stay Reduction (23.2%, 19.83%)
1	M	16	Flame	48%	Face, neck, thorax, abdomen, upper and lower limbs	Lower Limbs	II-III	No	No	No	4	48	25	48.97%
2	M	28	Flame	46, 50%	Face, upper and lower limbs	Upper and lower limbs	II-III	Yes	Obesity	Renal failure, sepsis, compartment syndrome	14	72.5	72	0.7%
3	M	42	Flame	50%	Neck, back, glutes, upper and lower limbs	Lower limbs	II-III	No	No	Sepsis, shock, compartment syndrome	6	52.2	41	20%

NPWT.<sup>8</sup> Despite its benefits, NPWTi-d was recommended for full-thickness burns after excision in the international consensus guidelines, yet the available literature on its effectiveness remains limited.<sup>7</sup>

The application of NPWTi-d on burn wounds has demonstrated a reduction in the time required for wound coverage. Gomez et al reported on two cases of electric burn patients who developed adequate granulation tissue in full-thickness burns within 5 days.<sup>5</sup> Similarly, Blome-Eberwein et al documented 15 cases and observed a mean reduction in the time to wound closure of 7.73 days compared with the center's prior experience.<sup>6</sup> Analysis showed an overall reduction in the LOS with the utilization of NPWTi-d, without resulting in infections or other complications. It is important to note, however, that Taylor's calculations do not account for comorbidities or complications like sepsis, renal failure, shock, or compartmental syndrome, all of which are known to prolong hospitalization.<sup>9,10</sup>

Our main limitation is the low number of cases presented, still our main objective was to present a tendency that might have an impact on the LOS.

In conclusion, our case series shows burn injury cases managed with NPWTi-d, where a reduction in the LOS was evidenced, despite the presence of systemic complications. These findings offer a preliminary glimpse into the potential impact of NPWTi-d on burn treatment. However, further research is necessary to substantiate this hypothesis.

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## DISCLOSURES

*Dr. Gomez-Ortega serves as a clinical consultant and as speaker of Solventum from which she receives compensation/royalties/sponsorships. All the other authors have no financial interest to declare in relation to the content of this article.*

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