The Importance of Flow through an NPWT Dressing for Proper Exudate and Negative Pressure Management

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STUDY OBJECTIVE

The study aims to characterize pressure and exudate management efficacy on systems utilizing an air filter with a known continuous air flow rate on modeled wounds and compare to systems with no air leak or non-continuous air flow.

INTRODUCTION

Negative pressure wound therapy (NPWT) has extensive evidence demonstrating benefits for healing chronic and hard-to-heal wounds[1-6].

- Pressure helps to contract the wound and stimulate cellular proliferation in generating granulation tissue[1,7]
- Exudate management ensures the removal of inhibitors of wound healing, and the inflow of interstitial fluid brings biomolecules that promote wound healing[1,7]

Some wounds treated with NPWT do not respond to treatment and develop complications such as maceration, infection, or wound degradation[1]. Why?

- Inadequate airflow through a dressing allows exudate to accumulate
- Exudate accumulation reduces pressure at the wound bed and causes maceration
- Mismanaged NPWT leads to complications

To properly manage wound bed pressure, a NPWT dressing requires airflow to remove exudate from the wound.

This study demonstrates the difference between active control and passive control enabled by incorporating air filter technology (AF Tech) in the NPWT dome interface.

METHODS

AF Tech connected to one single-lumen NPWT system was compared to a closed wound and two market-leading single-lumen systems.

- Testing utilized an acrylic wound model with 125 cm^3 volume
- All wound models dressed with the identical drape and black foam
- Pressure applied to wound bed measured under the wound filler
- Simulated exudate introduced distal to the dome and utilized a 50-cc pre-fill to eliminate dead space in the model wound
- NPWT devices placed 3 feet above wound model and set to deliver 125 mmHg to the wound bed

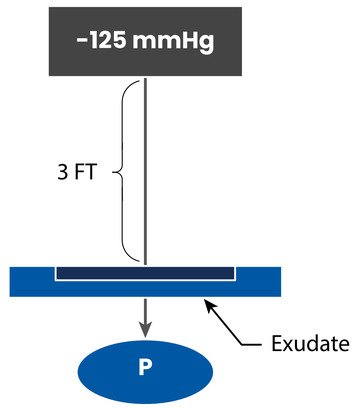

Figure 1 **Experimental Design**

NPWT Systems Evaluated

- Closed system (NP with no air-leak)
- AF Tech Single-Lumen
- Dual-Lumen System 1 (NPWT system for home)
- Dual-Lumen System 2 (NPWT system for hospital)

Conditions Evaluated

- NPWT managed in a single wound model
- NPWT management in two wound models connected to one NPWT system

EXUDATE & PRESSURE MANAGEMENT IN A SINGLE WOUND MODEL

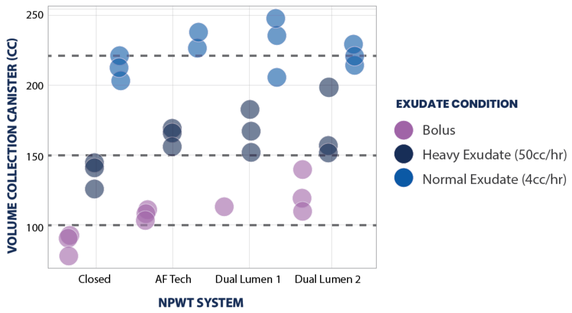

Figure 2 **Exudate Management in Single Wounds**

	AF Tech	Closed	Dual Lumen 1	Dual Lumen 2
Percent Exudate in Canister	83.8%	75.4%	82.4%	78.2%
Retained Exudate	44.2	68.8*	48.8	61.1
Average Pressure (± 3σ; mmHg)	121.6±11.3	76.3±49.0	122.8±17.3	121.9±9.7
Percent ± 10 mmHg of 125 mmHg	99.2%	0%	96.9%	97.0%

*$p < 0.05$ from the conditions

Table 1 **Summary Data for Single Wound Model Training**

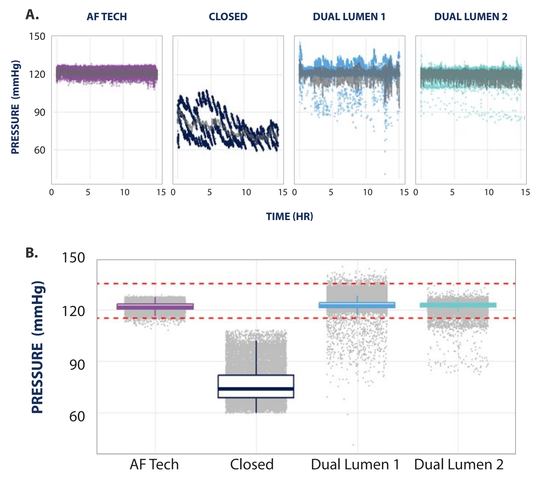

Figure 3 **Pressure Management in Single Wounds**

A.) Displays pressure data against time. **B.)** Box and whisker plot with ± 10 mmHg from target pressure and individual pressure measurements.

PRESSURE MANAGEMENT IN Y-CONNECTED WOUNDS

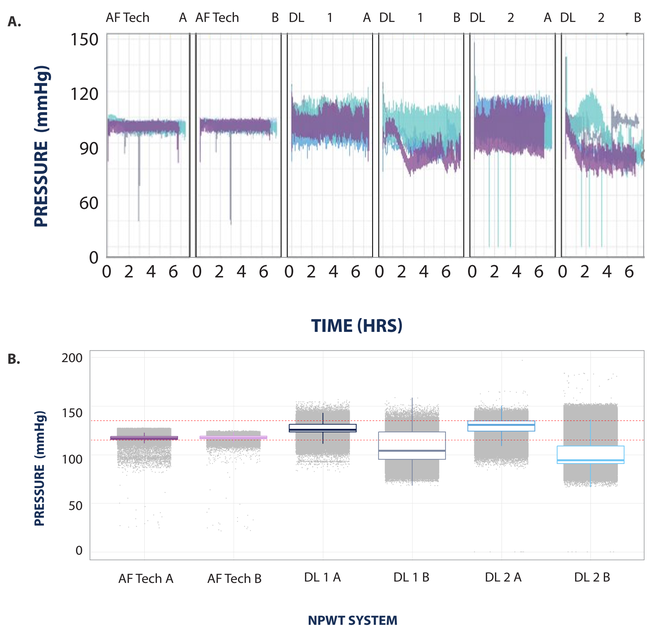

Figure 4 **Pressure Management in Y-Connected Wounds**

A.) Displays pressure data against time. **B.)** Box and whisker plot with ± 10 mmHg from target pressure and individual pressure measurements.

DISCUSSION & CONCLUSIONS

Performance differences of NPWT systems that incorporate continuous controlled air leaks vs non continuous leak systems show benefits in certain conditions.

The controlled leak allows a single-lumen system to manage pressure and exudate similarly to dual-lumen systems in one wound.

- Closed system unable to maintain pressure or properly manage exudate
- Dual-lumen system had a larger dynamic range than the continuous controlled leak condition

When using a Y-connector, the controlled leak at both wounds allowed the single-lumen system to properly manage pressure where dual-lumen system could not in the unmonitored wound (DL 1 B and DL 2 B).

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