Performance of Prevent, A Novel Negative Pressure Wound Therapy Filler on Wound Contraction

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BACKGROUND

- **Negative pressure wound therapy enhances healing** by evacuating fluid, reducing edema, increasing perfusion, and promoting granulation tissue formation
- **Foam dressings generate microdeformation and macrodeformation**, with macrodeformation producing clinically important wound contracture under suction
- Foam's **porous structure allows tissue ingrowth**, leading to painful dressing changes and potential trauma to new granulation tissue
- The **Prevent thermoplastic elastomer dressing is clear and nonporous**, avoiding ingrowth, but its ability to generate macrodeformation compared with foam has not been previously evaluated

AIM

The current study aimed to examine the performance of the **TPE dressing** compared to traditional **ROCF NPWT dressings** with regards to **wound contraction (macrodeformation)** in a **porcine explant model**.

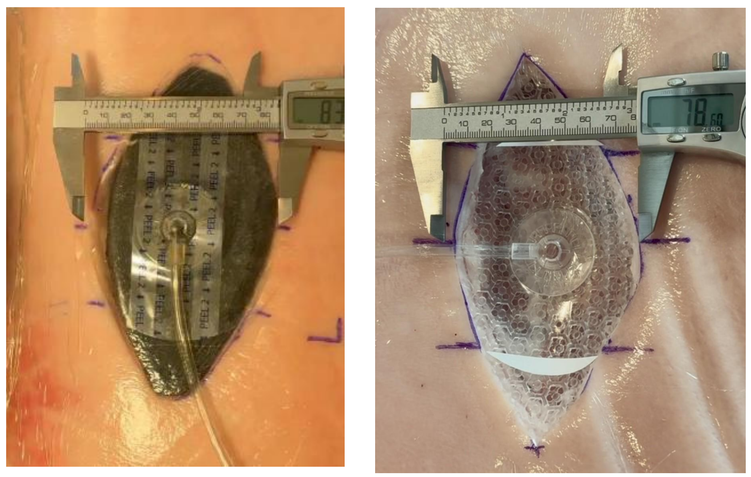

Figure 1: Representative image of experimental setup

METHODS

- **Three porcine dorsal quarters** (skin to bone, approximately 100kg)
- **Elliptical wounds** (15cm x 7.5cm), shallow depth **0.5 to 1cm**, deep depth **2 to 3cm**
- Dressings tested: **ROCF**, **TPE**, **no filler**
- Negative pressure: **50, 80, and 125mmHg**, three trials each
- Wound width measured at **three positions** using a digital caliper
- Primary outcome: **macrodeformation** defined as baseline width minus width during negative pressure
- **Univariable and multivariable regression** performed

	Magnitude of Contraction (mm) (SE)	P-value
Dressing (Reference=None)		
TPE	-1.15 (0.26)	**<0.001**
ROCF	-1.38 (0.26)	**<0.001**
Position (Reference=Center)		
Left	4.92 (0.59)	**<0.001**
Right	5.33 (0.66)	**<0.001**
Pressure (Reference=50mmHg)		
80 mmHg	-0.45 (0.26)	0.090
125 mmHg	-1.17 (0.26)	**<0.001**
Original Width	1.24 (0.03)	**<0.001**
Deep Wound Depth (Reference-Shallow)	-2.47 (0.22)	**<0.001**

Table 1: Multivariable analysis of factors associated with increased wound contraction in all wounds

RESULTS

- Overall, the **TPE dressing produced similar macrodeformation in shallow wounds and greater macrodeformation in deep wounds** compared to sponge dressing
  Other variables **significantly associated with increased wound contracture** included **higher negative pressure**, **measurement position**, and **smaller pre-NP wound width**
  TPE generated equivalent contraction in shallow wounds and significantly greater contraction in deep wounds compared to ROCF

Average Contraction*	-125mmHg	-80mmHg	-50mmHg
Shallow/Partial Thickness Wound (0.5 to 1.0cm depth)			
TPE	3.69	3.20	2.82
ROCF Foam	5.36	4.31	3.31
Deep/Full Thickness Wound (2.0 to 3.0cm depth)			
TPE	6.91	5.16	4.89
ROCF Foam	5.36	4.31	3.31

Table 2: Average contraction for each dressing, at each NP level (mm)

CONCLUSIONS

- In both deep and shallow wounds, **TPE and ROCF produced a statistically significant increase in wound contracture** compared to no filler when controlling for measurement position, applied pressure, and pre-NP width (**p<0.05**)
- In deep wounds, **TPE generated significantly greater wound contracture than black foam ROCF** (**p<0.05**)
- Placement of a **black ROCF widened the wound cavity prior to negative pressure**, an effect **not observed with TPE**
- Overall, **TPE @-50mmHg produced similar macrodeformation** compared to traditional black ROCF sponge @-125mmHg

Variable	Beta-coefficient	CI, 95%	P-value*
Dressing type			
None (reference)	—	—	—
Prevent	0.77	0.09 to 1.44	**0.027**
Sponge	0.21	-0.47 to 0.89	0.541
Negative pressure setting			
50 mmHg (reference)	—	—	—
80 mmHg	0.36	-0.31 to 1.04	0.294
125 mmHg	1.26	0.58 to 1.94	**<0.001**
Wound depth			
Shallow < 2 cm (reference)	—	—	—
Deep > 3 cm	2.18		
Specimen source			
Pig 1 (reference)	—	—	—
Pig 2	1.11	0.24 to 1.99	**0.012**
Pig 3	4.84	3.97 to 5.71	**<0.001**
Pig 4	2.73	1.86 to 3.61	**<0.001**
Pig 5	2.18	1.31 to 3.05	**<0.001**

Table 3. Independent Predictors of Wound Contraction on Multivariate Regression