

## Mechanical Efficacy of a Low-Cost Negative Pressure Wound Therapy System

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**Introduction:** Negative pressure wound therapy is a well-established, effective treatment for acute and chronic wounds but remains unaffordable in many low- and middle-income countries. We therefore developed the Vacuum-Assisted Therapy Affordable for All (VATARA) system, consisting of a low-cost suction pump with adjustable pressure and pressure gauge. We evaluated VATARA's efficacy to achieve and maintain a safe negative pressure, and investigated the use of gauze as a low-cost substitute for standard foam dressing.

**Methods:** Using 3 fresh-frozen lower-limb cadavers (Medcure), we created ellipse-shaped wounds simulating combat injuries (ranging from 10×14cm to 20×27cm). Three dressings were tested sequentially on each wound: porous foam, fluffed gauze filled to skin level, and gauze 25-40mm above skin level. Plastic adhesive film was used to seal the wounds which were connected to VATARA with suction tubing and canister. A 23-gauge needle connected to a pressure monitor (PressureMat DPG) was used to measure pressures at the center, midway, and edges of the wounds (Zone 1, 2, and 3), with VATARA set to -127 mmHg. Using GraphPad Prism, two-way ANOVA and posthoc Tukey's tests were conducted to examine variation in pressure with dressing type and wound zone. Two-tailed p-values less than 0.05 were considered significant.

**Results:** With all three methods of dressing, VATARA achieved adequate negative pressure ranging from -128 to -147mmHg. Dressing type had a significant effect on achieved pressure ( $P=0.003$ ) but not on pressure variation across the wound ( $P=0.24$ ). There was a significant pressure difference between foam and gauze 25mm above skin level at zones 2 and 3, and between gauze at skin level and gauze 25mm above skin level.

**Discussion:** VATARA was effective in achieving adequate wound suction and is an efficacious adjuvant therapy in low-resource settings. Although porous foam dressings are standard in the United States, we found that using adequate layers of fluffed sterile gauze can achieve similar or improved negative pressure across the wound, with statistically negligible pressure gradient across the wound.

**Significance/Clinical Relevance:** The development and evaluation of the Vacuum-Assisted Therapy Affordable for All (VATARA) system provide a promising avenue for delivering effective wound treatment in low- and middle-income countries.

