

Sacral skin blood flow response to alternating pressure operating room overlay

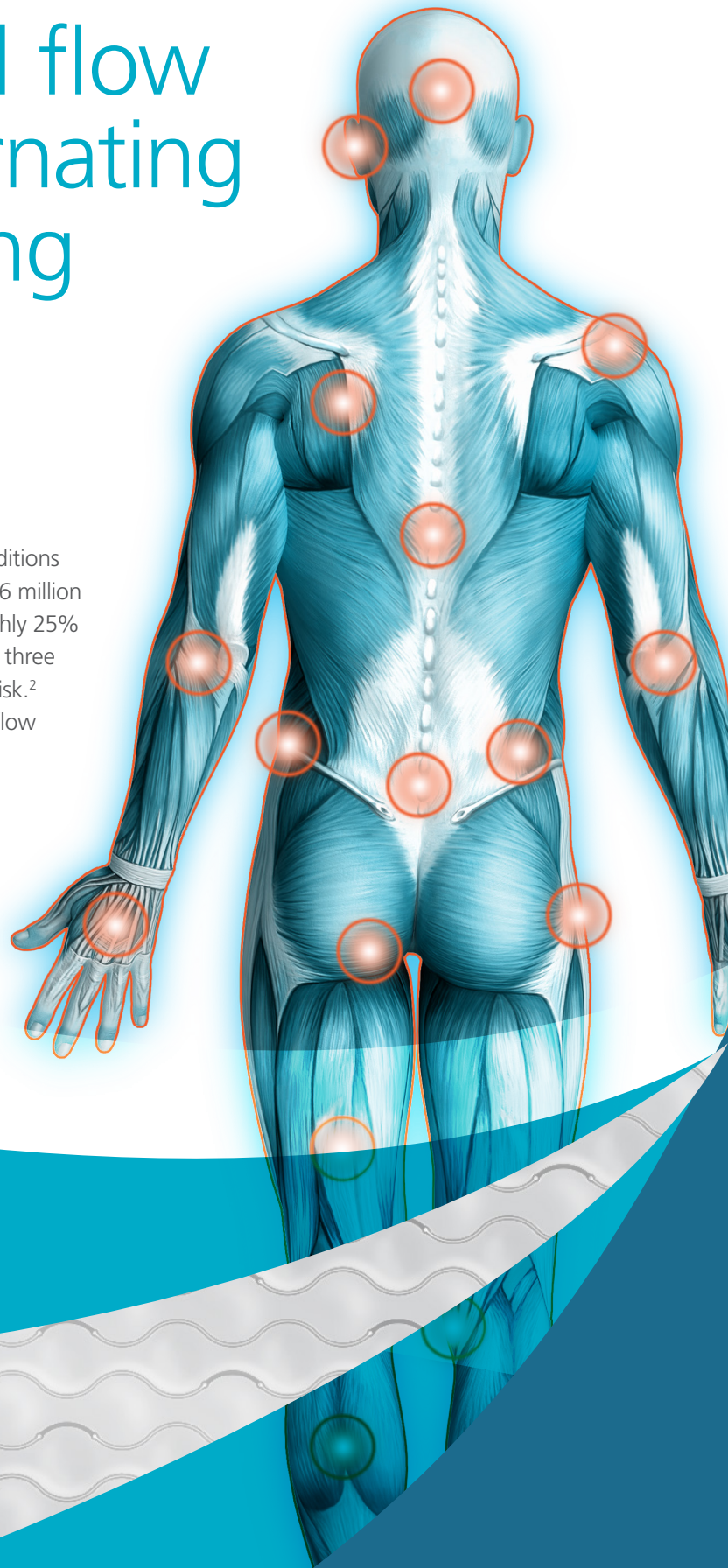
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BACKGROUND:

Lengthy surgeries often expose bony prominences to loading conditions associated with high risk of developing pressure injuries. Of the 1.6 million pressure injuries that develop in acute care settings annually, roughly 25% are acquired intra-operatively during surgeries that last more than three hours.¹ Prolonged ischemia may be one of the factors increasing risk.² Alternating pressure (AP) has been shown to increase skin blood flow (SBF) in a controlled laboratory protocol.³

OBJECTIVE:

The study objective was to compare the response of sacral skin blood flow on a foam operating room (OR) pad with and without an AP overlay.



METHODS:

An experimental, crossover research design was conducted in the laboratory with and without an AP overlay (DabirAIR) on a 2 inch highly resilient foam OR pad. Ten healthy young subjects (mean age: 27.5±5.7 years, BMI: 26.8±7.0 kg/m²) and nine elderly subjects (mean age: 68.4±6.2 years, BMI: 25.4±3.4 kg/m²) laid supine for sixty minutes in each condition while sacral SBF data was collected using a laser Doppler blood flow optic probe. The AP surface was set on a ten minute cycle and low firmness (two zones were alternately inflated for five minutes each). The percent change in mean normalized SBF over the last ten minutes compared to the first ten minutes for each condition was used for analysis. The percent change represents the physiological response to each test condition. The difference in this measure between test conditions quantified the effect on SBF of the AP surface + OR Pad relative to the OR Pad alone. Interface pressure (IP) under the sacrum (SBF probe location) was measured for both test conditions.

RESULTS:

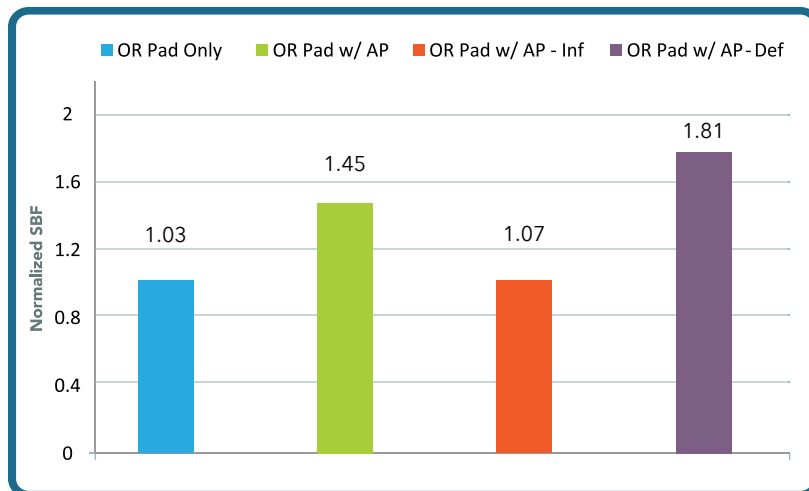
Mean SBF was greater with the overlay (AP mean SBF=1.45±1.16; OR mean SBF=1.03±0.46; p=0.1).

The SBF during deflation cycles of the AP surface was 80% higher than the baseline SBF.

The peak and average IP under the sacrum was significantly lower for the ORpad w/AP group vs. OR pad alone.

“The AP support surface was more effective at increasing sacral SBF over time than the operating room pad alone, especially in participants with lower BMI.”

| IP at Sacrum mmHg | OR Pad only | OR Pad w/AP | p-value |
|-------------------|-------------|-------------|---------|
| Peak Pressure | 35.5 (10.8) | 21.8 (11.7) | <0.001 |
| Average Pressure | 28.7 (8.6) | 17.5 (9.0) | <0.001 |



CONCLUSION:

The AP support surface was more effective at increasing sacral SBF over time than the operating room pad alone, especially in participants with lower BMI. Interface pressure at sacrum was significantly lower for AP surface during deflation cycles.

Normalized, mean SBF (graph) was higher (1.45±0.46 vs 1.03±1.16) with the AP support surface (green bar, full cycle) compared to OR pad only (blue bar) during supine loaded position. For the AP overlay, the normalized SBF during deflation cycle (brown bar) was 80% higher compared to the inflation cycle (1.81±1.7 vs. 1.07±0.74).

REFERENCES:

1. Beckrich, K., & Aronovitch, S. (1999). Hospital-acquired pressure ulcers: A comparison of costs in medical vs. surgical patients. *Nursing Economic\$,* 17(5), 263-271. Retrieved March 17, 2016
2. Oomens, C.W., et al., Pressure induced deep tissue injury explained. *Annals of biomedical engineering,* 2015. 43(2): p. 297-305.
3. Jan, Y, et. al. (2008) Wavelet-based spectrum analysis of sacral skin blood flow response to alternating pressure. *Archives of Physical Medicine and Rehabilitation,* 89(1), 137-145.