

PreShear™: The Forces Behind Pressure Ulcer Development

The weight of the body (Force = mass x acceleration) must be supported by a surface delivering an equal amount of force (Newton's Third Law). The resultant surface force is delivered to the body at two angles (perpendicular and parallel) over an area of contact (Stress = Force over Area). The greater the area of contact, the less magnitude of the supporting stress is required to support the body. The reaction of the soft tissue to the support surface is a stress to strain reaction (relationship).

The media (fluid or solid) determines which type of supporting stress occurs at the body-support surface interface. Static Fluid (gas or liquid) systems deliver predominately non-gradient perpendicular stress (pressure) over the entire contact surface (Pascal's Principle), while solids deliver predominately parallel stresses (shear) in a gradient fashion (non-flotation).

The soft tissue is a pliable tissue that changes dimension (strain) over time. This viscoelastic quality gives protection to the soft tissue by absorbing external stresses with less resultant strain. The viscoelastic quality is caused by fluid in the soft tissue. The support surface stress is transmitted through the viscoelastic soft tissue causing either volumetric support (non-distorting compression) or shape change (shear). The viscoelastic soft tissue is practically incompressible but easily deformed. This shape distortion (shearing) causes vessel crimping with subsequent necrosis of the tissue if not relieved.

At the bony prominence the force component of the stress formula can be magnified due to the mechanical advantage resulting from the shape of the bony prominence (wedge effect). To protect this unwanted mechanical affect, we must either amputate the bony prominence or maintain proper orientation at the soft tissue-bony prominence interface. This can only be accomplished by maintaining volumetric soft tissue orientation (non-distorting) in a non-gradient, perpendicular stress creating environment (atmosphere) delivered by a static fluid support surface system (Flotation).