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Deformation is a cell killer: protecting tissues by minimizing exposure to sustained deformations

Amit Gefen, PhD
Department of Biomedical Engineering, Faculty of Engineering, Tel Aviv University,
Tel Aviv 6997801, Israel

Sustained internal mechanical deformations, strains and stresses in soft tissues during immobile weight-bearing postures (e.g. in bed or in a chair) were identified as a fundamental cause for the onset and progression of pressure ulcers (injuries), particularly of the deep tissue injury type.

The sustained deformations in tissues may compromise tissue viability through distortion of cell shapes and internal structures, which damages their biological function and eventually causes loss of cell homeostasis, e.g. by causing abnormal transport changes. In addition, the sustained deformations impair blood perfusion and lymphatic flow, which suppresses tissue metabolism and lowers tissue pH.

This talk will review some of our published research concerning the effects of sustained deformations on soft tissue viability and function, with a focus on how minimizing tissue deformations should be a goal for maintaining cell homeostasis and tissue integrity in fragile individuals. Specific examples which will be covered during the talk concern:

- the immersion and envelopment of the buttocks by wheelchair cushions, which determine the exposure to mechanical stress concentrations and localized deformations in soft tissues near the bony prominences of the pelvis;

– biomechanics and physiology of the buttocks tissues while sitting on the toilet for prolonged times, and how such sitting may compromise tissue viability;

- the adjustability of support surfaces to misplaced medical equipment in the context of medical device-related pressure ulcers.

Email: gefen@eng.tau.ac.il