

Aetiology and Risk Factors of Deep Tissue Injury Explained

Marisa Graser

Purpose – The soft tissues covering bony prominences often encounter unique biomechanical challenges. Although not intended to tolerate high loads and deformation, they become part of the weight-bearing structure in surgical and bedfast patients, wheelchair users and lower-limb amputees^{1–4}. Consequently, deep soft tissue layers may be damaged, resulting in Deep Tissue Injury (DTI)⁵. However, the underlying aetiological and risk factors are subject to ongoing debates⁶. Based on a scoping review, the state-of-the-art knowledge on DTI is presented.

Methodology/approach – The focus of the scoping review was on lower-limb amputees as one of the lesser-known populations susceptible to DTI development. The search across the databases Pubmed, Ovid Excerpta Medica, and Scopus identified 16 peer reviewed, English-language studies. The areas of interest were (1) the population-specific aetiology, (2) risk factors, and (3) methodologies to investigate both.

Findings – The results indicate that DTI development is dependent on a complex interplay of mechanical, anatomical, and physiological factors acting on different organisational levels, from the external environment over soft tissue through to single cells. Whilst the loading conditions play a major role, they are strongly influenced by individual determinants. However, methodological limitations, high inter-patient variability, and small sample sizes complicate the interpretation of outcome measures. Additionally, fundamental research on cell and tissue reactions to dynamic loading and on its influence on the vascular and lymphatic systems is missing.

Practical implications – We therefore recommend increased interdisciplinary research endeavors with a focus on closing the identified gaps to widen our understanding of DTI. The results have the potential to initiate much-needed advances in surgical, clinical, and prosthetic practice and inform future pressure ulcer classifications and guidelines.

Keywords – pressure ulcer, leg prosthesis, soft tissue injuries, biomechanics, risk factors

Paper type – Research paper

References

1. Mak, A. F. T., Zhang, M. & Tam, E. W. C. Biomechanics of Pressure Ulcer in Body Tissues Interacting with External Forces during Locomotion. *Annu Rev Biomed Eng* 2010 12, 29–53 (2010).
2. Bader, D. L., Worsley, P. R. & Gefen, A. Bioengineering considerations in the prevention of medical device-related pressure ulcers. *Clin. Biomech.* 67, 70– 77 (2019).
3. Gefen, A. The biomechanics of sitting-acquired pressure ulcers in patients with spinal cord injury or lesions. *Int. Wound J.* 4, 222–231 (2007).
4. Bogie, K. & Bader, D. Susceptibility of Spinal Cord-Injured Individuals to Pressure Ulcers. in *Pressure Ulcer Research* 73–88 (Springer-Verlag, 2005). doi:10.1007/3-540-28804-X_6.
5. National Pressure Ulcer Advisory Panel. NPUAP Pressure Injury Stages. <http://www.npuap.org/resources/educational-and-clinical-resources/npuap-pressure-injury-stages/> (2016).
6. Gould, L. J. *et al.* Pressure ulcer summit 2018: An interdisciplinary approach to improve our understanding of the risk of pressure-induced tissue damage. *Wound Repair Regen.* (2019) doi:10.1111/wrr.12730.