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TRANSTIBIAL PROSTHETIC USERS AS A RISK GROUP FOR DEEP TISSUE INJURIES

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Introduction: The replacement of the lower leg with a transtibial prosthesis poses a high biomechanical challenge for the surrounding body structures: Loads that are usually distributed across the skeletal system are now transferred to the prosthesis via soft tissues. Since those tissue layers are not physiologically adapted to be weight-bearing structures, amputees might develop Deep Tissue Injuries (DTI). To gain a better understanding of the underlying processes and population-specific influences, we aimed to map out and analyse existing research on aetiology and risk factors for DTI in transtibial amputees, and highlight open questions.

Methods: Following the PRISMA-ScR guidelines for scoping reviews, we conducted a systematic search across the databases Pubmed, Ovid Excerpta Medica, and Scopus on June 14th, 2019. This search returned 99 records, of which 11 met the inclusion criteria. An additional 5 sources were identified through supplementary scanning of reference lists and forward citations. We extracted information using a pre-designed data charting form, before grouping the studies by research focus into the following categories: (1) Aetiology, (2) Risk factors, and (3) Methodologies to investigate both.

Results: A total of 16 studies were evaluated. The analysis of various loading scenarios indicates that transtibial prosthetic users may be at risk for DTI development. Individual surgical, morphological, and physiological determinants, as well as the choice of prosthetic componentry seem to play a major role in this. However, the methodologies employed within the studies showed substantial heterogeneity in design and outcomes, and often suffered from high inter-patient variability and small sample sizes, which interfered with the comparison and interpretation of outcome measures. For a comprehensive insight into the underlying processes, fundamental research on cell and tissue reactions to dynamic loading and on its influence on the vascular and lymphatic systems would need to be integrated as well.

Conclusions: The overall body of research on DTI in transtibial prosthetic users is sparse. However, as there is a strong indication of transtibial prosthetic users being a risk group of DTI, we recommend an increased interdisciplinary research effort within this area. A better understanding of prosthesis-related deep soft tissue damage has the potential to initiate much-needed clinical advances in surgical and prosthetic practice and can complement existing research and practices related to DTI in general.

References:

Graser, M., Day, S. & Buis, A. Exploring the role of transtibial prosthetic use in deep tissue injury development: a scoping review. *BMC biomed eng* 2, 2 (2020). <https://doi.org/10.1186/s42490-020-0036-6>