The mechanical failure of locally manufactured prosthetic feet from the Jaffna Jaipur Centre for Disability Rehabilitation (JJCDR), Sri Lanka

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Abstract

Background: The International Organization for Standardization (ISO) 10328 standards are used to verify the safety of lower limb prosthetic devices. However, the ISO 10328 tests are performed in sterile laboratory settings and do not account for environmental or sociocultural factors associated with prosthetic use. Most locally manufactured prosthetic feet from low-income and middle-income countries, which are safely used for years, do not meet these standards. In this study, we investigate the modes of wear patterns of naturally worn prosthetic feet from Sri Lanka.

Objective: To characterize wear patterns of locally manufactured prosthetic feet from low-income and middle-income countries.

Methods: Sixty-six replaced prosthetic feet from the Jaffna Jaipur Center of Disability and Rehabilitation were analyzed. Delamination between the keel and rest of the foot could not be detected with ultrasound. Sole wear pattern was quantified by photographing soles and dividing them into 200 rectangles and scoring the rectangle's wear from 1 to 9 (no to extreme wear). Homologous scores were averaged to create a contour map of prosthetic foot wear.

Results: The highest levels of wear occurred at the heel, end of the keel, and the perimeter of the prosthetic foot. All regions of the prosthetic feet had significantly different wear scores ($p < 0.005$).

Conclusions: Locally manufactured solid ankle cushion heel feet display high levels of wear in localized areas of the sole of prosthetic feet, which can limit their life span. High levels of wear occur at the end of the keel, which would not be detectable in the ISO 10328 tests.