

Gait analysis methodology for the measurement of biomechanics parameters in total knee arthroplasty

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Abstract

Gait analysis using external skin markers provides scope for the study of kinematic and kinetic parameters shown on different total knee prostheses. Thus an appropriate methodology is of great importance for the collection and correlation of valid data. Calibration of equipment is of great importance before measurements, to assure accuracy. Force plates should be calibrated to 1080Hz and optoelectronic cameras should use 120Hz frequency, because of the nature of gait activity. Davis model which accurately defines the position of the markers is widely accepted and cited, for the gait analysis of TKA's. To ensure the reproducibility of the measurement, a static trial at the anatomical position must be captured. Following, all acquisitions of dynamic data must be checked for consistency in walking speed, and abnormal gait style because of fatigue or distraction. To establish the repeatability of the measurement, this procedure must be repeated at a pre-defined number of 3-5 gait cycles. Anthropometric measurements should be combined with three-dimensional marker data from the static trial to provide positions of the joint's center and define anatomical axes of total knee arthroplasty. Kinetic data should be normalized to bodyweight (BW) and percentage of BW and height depending on the study. External moments should also be calculated by using inverse dynamics and amplitude-normalized to body mass (Nm/kg). Gait analysis using external skin markers provides important data for the study of TKA biomechanics. When an accurate and adequate methodology is followed kinematic and kinetic parameters of TKA's could be calculated sufficiently and provide important data for further development of total knee implant designs.

Biography

Papagiannis I Georgios completed his Bachelor of Science in Physical Therapy in 2005. His graduate work at the University of Strathclyde in Glasgow, United Kingdom centered at the area of Rehabilitation Biomechanics, where he was granted the title Master of Science in Applied Biomechanics (2007). At Karolinska Institutet he concentrated in the graduate education of neuroscience (2008). Currently, he has completed his PhD studies in Orthopaedic Biomechanics at the faculty of medicine, National and Kapodistrian University of Athens (NKUA), Greece. Since November 2011, he serves as a Scientific Consultant the biomechanics laboratory "Sylvia Ioannou" (NKUA). His research focuses at the biomechanics of hip and knee arthroplasties.

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