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AI-Driven Gait Analysis Reveals Functional Mobility Improvement After an 8-Week Digital Health Intervention in Patients With Chronic Kidney Disease

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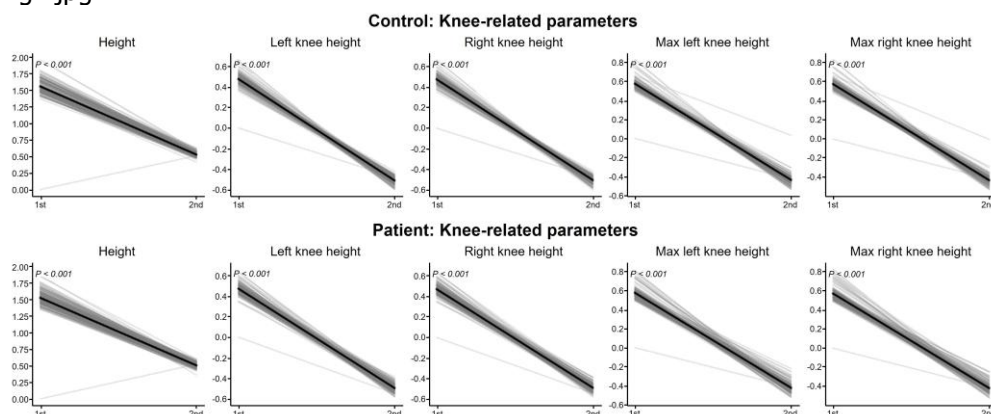
Objectives : Chronic kidney disease (CKD) is associated with sarcopenia, impaired mobility, and increased fall risk. Objective assessment of functional changes following intervention remains limited. We evaluated the impact of an 8-week digital health intervention on gait parameters using artificial intelligence (AI)-based motion analysis.

Methods : A total of 358 participants (171 controls and 187 CKD patients) who completed baseline and follow-up assessments were analyzed. Participants underwent an app-based personalized health intervention including exercise and nutritional guidance. Functional performance was evaluated using Timed Up and Go (TUG), Tinetti score, handgrip strength, bioelectrical impedance analysis (BIA), and AI-driven three-dimensional gait analysis (44 parameters, Azure Kinect).

Results : At baseline, CKD patients showed significantly impaired mobility compared with controls, including longer TUG time, lower gait velocity, reduced grip strength, and higher sarcopenia prevalence. After 8 weeks, both groups demonstrated significant reductions in TUG time (controls: 9.90→8.59 sec; CKD: 12.25→11.09 sec; both $p < 0.001$). AI-based analysis revealed significant decreases in knee elevation and vertical displacement parameters, suggesting improved gait efficiency and postural stability. Gait velocity did not significantly change. Despite functional improvements, BIA parameters showed no favorable changes; CKD patients exhibited slight decreases in skeletal muscle index and increases in body fat percentage.

Conclusions : An 8-week digital health intervention improved functional mobility and gait efficiency in CKD patients without measurable improvement in body composition. AI-based gait analysis may serve as a sensitive and clinically applicable digital biomarker for functional assessment in CKD.

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