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Comparative Study of Mechanical and Physiological Gait Efficiency Following Anterior Cruciate Ligament Reconstruction

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Abstract : Background: Evaluation of gait efficiency is used to examine energy consumption especially in patients with movement disorders. Hypothesis/Purpose: This study compared the physiological and mechanical measures of gait efficiency between patients with ACL reconstruction (ACLR) and healthy controls and correlated among these measures. Methods: Seventeen patients with ACLR and sixteen healthy controls with mean ± SD age 23.06±4.76 vs 24.85±6.47 years, height 173.93±6.54 vs 175.64±7.37cm, and weight 74.25±12.1 vs 76.52±10.14 kg, respectively, participated in the study. The patients were operated on six months prior to testing. They should have completed their accelerated rehabilitation program during this period. A 3D motion analysis system was used for collecting the mechanical measures (Biomechanical Efficiency Quotient (BEQ), the maximum degree of knee internal rotation during stance phase and speed of walking). The physiological measures (Physiological Cost Index (PCI) and Rate of Perceived Exertion (RPE)) were collected after performing the 6- minute walking test. Results: MANOVA showed that the maximum degree of knee internal rotation, PCI, and RPE increased and the speed decreased significantly ($p<0.05$) in the patients compared with the controls with no significant difference for the BEQ. Finally, there were significant ($p<0.05$) positive correlations between each of the PCI & RPE and each of the BEQ, speed of walking and the maximum degree of knee internal rotation in each group. Conclusion: It was concluded that there are alterations in both mechanical and physiological measures of gait efficiency in patients with ACLR after being rehabilitated, clarifying the need for performing additional endurance as well as knee stability training programs. Moreover, the positive correlations indicate that using either of the mechanical or physiological measures for evaluating gait efficiency is acceptable.

Keywords : ACL reconstruction, mechanical, physiological, gait efficiency
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