Kinematics and kinetics analysis of gait in ankylosing spondylitis subjects

A. Guiotto¹−*, S. Del Din¹, E. Carraro², Z. Sawacha¹, G. Leopaldi¹, L. Baldi², R. Guglielmin², M. Sambini², S. Massiero², C. Cobelli¹

¹ Department of Information Engineering, University of Padova, Padova, Italy
² Department of Rehabilitation, University of Padova, Padova, Italy

Introduction: Ankylosing spondylitis (AS) is defined as the formation of a stiff joint by consolidation of the articulating surfaces and inflammation of the vertebral column. In AS, the spine becomes rigid from the occiput to the sacrum; this leads to a stooped position, with inability to see the horizon, and a shock absorption response phase.

Materials and methods: Twelve normal subjects (N) (mean age: 59.0 ± 5.2 years, mean BMI of 24.0 ± 2.9) and 12 AS patients (mean age: 47 ± 15 years, mean BMI: 24 ± 3) were studied. Six cameras BTS motion capture system (60–120 Hz) and surface EMG (PocketEMG, 16 channels) synchronized with two Bertec force plates (FP4060-10), integrated with two Imago S.n.c plantar pressure systems (0.64 cm² resolution, 150Hz) were used. A modified version of Leardini et al. [3] was adopted [4]. Roemberg test and 3D-motion analysis of independent barefoot walking were performed. The average kinematic and kinetic data from three trials was extracted. One-way Anova (A), to compare mean values, and Manova (M), to appreciate differences over percentages of gait cycle, were computed (Matlab) for all measures in each gait cycle phase.

Results: As for the gait cycle, in AS patients the data show an increased extension angle of the trunk (mean 7.6 ± 4.7°, p < 0.01 with A) with hip decreased mean flexion angle (mean 6.44 ± 4.7°, p = 0.04 with A) together with a reduction hip flexion-extension FE range of motion (ROM) (see Table 1, p < 0.001 with A) and increased knee FE ROM (see Table 1, p = 0.02 with A). Decreased stride length (0.89 ± 0.19 m, p < 0.01 with A) was registered. During the loading response, at ankle joint, a pattern of dorsiflexion (7.89 ± 5.23°, p < 0.01 with M) instead of plantaflexion (Fig. 1) was observed, the hip decreased its flexion angle (17.4 ± 9°, p < 0.01 with M) and the antero-posterior forces increased in the first half of the midstance (4.3 ± 1.8% body weight, p = 0.005 with M).

Discussion: These preliminary results show gait pattern alteration as consequence of trunk stiffness of AS; so far this should be considered when planning more specific rehabilitation programs.

References


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