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FRI0405 GAIT ANALYSIS IN COXAPTHROSIS USING AN ACCELEROMETRIC DEVICE

B.F. Auvinet[1], E. Barrey[2], D. Chaleil[3]. *[1] Rhumatology, Hospital, Laval, [2] LIGE, STAPS - Batiment Maupertuis, Evry, [3] Service de Pharmacie Clinique, Faculté de Pharmacie, Angers, France*

Background: Gait analysis in hip osteoarthritis is still a controversial subject. Kinematic analysis brings spatio-temporal information: gait in coxarthrosis is characterized by a reduction of walking speed, a decreased range of hip flexion-extension which is related to limitation of hip extension before toe off in the late stance phase [1]. Force plate provides information through the ground reaction force, which is characterized by a reduction of the loading peak, which has been related to a decrease of the load on the affected hip joint [2]. Moreover using ground reaction forces and segmental kinematics, the inverse newtonian method provided force estimation in the affected hip. Results obtained by this method are in discussion through direct measurements of human hip joint contact forces from instrumented implants [3,4].

Objectives: Our objective was to measure the lumbar energy modulus during the loading phase in coxarthrosis patients versus a control group.

Methods: Gait analysis system included two accelerometers held over the middle of the low back by means of a semi-elastic belt. Cranio-caudal and mediolateral accelerations were recorded at a frequency of 50 Hz [5]. Patients and controls were asked to walk at their own speed along a straight 30-meter long corridor. Two 20-second periods (there and back) of stabilized walking were used to calculate stride frequency, step symmetry, stride regularity and the energy of loading at high frequency level. The walking speed was measured with an electronic stop watch.

Participants were 28 coxarthrosis patients (women:12, men:16; age:62y (10); height:166m (7); weight:70kg (10); unilateral:21/28; Lequesne index:9(4)) and 28 matched controls for age, height and weight.

Results: Coxarthrosis gait was characterized by a reduction of walking velocity ($p<0.003$), which was explained by reduction of stride frequency ($p<0.05$) and step length ($p<0.004$). Symmetry and regularity indexes are deeply reduced ($p<0.000003$ and $p<0.00002$ respectively) and significantly correlated ($r=-0.75$, $r=-0.76$) to the severity of the coxarthrosis measured by the Lequesne index. A significant increase of the energy modulus in high frequency ($p<0.00006$) was observed on the side of the pathologic hip.

Our results, measured at the lower back, indicated an increased of the constraint forces over the side of the coxarthrosis, which is in agreement with measurements in situ. Direct measurements of human hip joint contact forces from instrumented implants are higher than those estimated of contact forces based on external kinematic-ground reaction force data and inverse newtonian analyses. The explanation could be in the role of agonist-antagonist muscle groups, which contribute to joint stability. Co-contraction increases the pressure on cartilages of the joint.

Conclusion: Coxarthrosis patients reduced the speed, stride frequency, the symmetry and regularity of the walk. The high frequency loading on the ipsilateral limb increased. These measures appear of interest for prognostic of hip arthritis in routine practice.

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