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Wybrane parametry statyki i kinematyki ciała u pacjentów z idiopatyczną chorobą zwyrodnieniową stawu biodrowego

SUMMARY

Introduction: Osteoarthritis of the hip is a chronic disease which leads to a significant disability of patients. The progressive osteoarthritis (OA) leads to daily functioning disability, changes in gait's parameters, and decreased quality of life of patients. The long-lasting OA leads to various changes in a static posture. The studies of gait analysis of patients with severe hip OA are rarely compared with analyze 3D postural changes. Similarly, there is a lack of papers that discuss how changes in the gait pattern are related to patients-reported outcomes, including symptoms and their functional abilities. The typical clinical studies use the quantitative gait analysis, aiming to understand the patient's gait characteristics before and after surgical intervention. This study aimed to assess selected parameters of posture and kinematics parameters in patients treated for idiopathic osteoarthritis, based on cases suffering severe OA of the hip.

Material and methods: The study involved 64 patients (31 women and 33 men) treated in the Department of Orthopedics and Traumatology of the Locomotor System unilateral hip OA. All patients were in an advanced stage of the disease. Patients were waiting for the implantation of the primary Total Hip Arthroplasty. The tests were performed twice: 4 weeks before the first hip replacement surgery and six months after the procedure. The average age of the respondents was 64.7 years. The gait test was carried out using the VICON system at the CZD Gait Diagnostics Laboratory. The 3D structured light posture assessment system was used to evaluate the body posture in the statics. Functional Harris Hip Score, WOMAC Hip, HOOS, SF-36 instruments, and pain VAS scale were used to assess functional disability and quality of patients' life.

Results: Pathologic gait pattern was found in patients suffering the advanced stage of the unilateral hip osteoarthritis before Total Hip Replacement surgery. The decrease in the time-space parameters in relation to the standard (reduction of walking speed, length, and frequency of steps and shortening of the support phase in both lower limbs) were present in the gait pattern. In terms of kinematics, lowered range of a motion of the affected limb in the sagittal plane (the range of flexion in the contact phase with the ground was 25.9 ± 6.53 , in the support phase: 0.5 ± 8.33 and in the final support phase: 5.31 ± 9.6), as well as compensatory changes in the knee and ankle joint were noted. Numerous abnormalities in pelvic mobility have been observed, including increased pelvic tilt in the sagittal plane for 93.75% of subjects and the occurrence of the Trendelenburg sign. The severe unilateral hip osteoarthritis leads to changes in the patients' static posture evaluated using 3D surface topography system (3D ST). Decreased lumbar lordosis, increased thoracic kyphosis and increased anterior trunk inclination in the sagittal plane were observed in the study group using 3D ST. Anterior trunk inclination can derive from

the combination of hip flexion contracture, increased thoracic kyphosis and a decrease in the angle of lumbar lordosis. The relationship between the level of pain reported by patients significantly correlated ($p < 0.05$) with the gait single support phase of the affected limb and the range of motion of the affected lower extremity in the support phase. The correlation ($p < 0.05$) between the subjective assessment of functional abilities and gait parameters, it was observed. The association of the steps' length of both lower extremities with the global hip score measured by the WOMAC questionnaire and the level of physical functioning measured by the SF-36 questionnaire was found.

Similar correlations ($p < 0.05$) were observed for functional abilities and % contribution of the support phase and the participation of a single support phase in relation to the norm for both lower limbs. Several relationships were found between the range of motion of the affected hip joint in the sagittal plane and physical functioning measured according to the Harris Hip Score, HOOS and WOMAC questionnaires. The time of support phase and the range of mobility of the operated hip joint had a statistically significant impact on the quality of life of patients, measured according to the HOOS and SF-36 questionnaire. The kinematics of the unaffected lower extremity have the most significant impact on the level of patients-reported outcomes in the postoperative period.

Conclusions: The observed abnormalities due to severe hip OA in the preoperative period lead to the pathological gait pattern. Six months after the surgery, similarly to the pre-operative period the features of the pathological gait pattern are still observed. Disturbances in gait parameters exist along with the postural changes of the patients. The functional status of patients, the level of their symptoms and quality of life correlate with the gait abnormalities, particularly seen before THR surgery. Gait analysis may allow programming comprehensive rehabilitation process for patients suffering from hip osteoarthritis, before and after surgery.

Keywords: hip osteoarthritis, gait analysis, body posture, quality of life.