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**Tytuł pracy: Ocena zaburzeń chodu oraz statyki stop u pacjentów z reumatoidalnym zapaleniem stawów”**

**SUMMARY**

Rheumatoid Arthritis (RA) is a chronic inflammatory disease of the connective tissue, characterised by symmetrical inflammation of joints, breakdown of the joint's cartilage, extraarticular changes and, frequently, organ complications. RA is classified as a systemic disease which reduces mobility, leading to disability and premature death. Women are three or four times more likely than men to suffer from RA. The full etiology of the disease is still unknown, its pathogenesis being multifactorial and complex. The main symptoms of the disease are pain and morning stiffness lasting up to a few hours. General symptoms such as fatigue, weight loss, weakness and subfebrile states frequently precede articular changes. Chronic inflammation results in the involvement of all the structures constituting a joint: ligaments, cartilage, muscles and bones. The ensuing deformations limit the range of patient's functional capabilities. Deformations most frequently affect the small joints of hands and feet. The foot constitutes a highly significant element of the musculoskeletal system, playing an important role in maintaining the right body posture and being responsible for movement. Typical deformations of the foot are hallux valgus, hammer toe and mallet toe, as well as changes connected with the shape of the foot arch such as flat foot. First articular deformations become visible as early as two years after the disease onset, emphasising the importance of early diagnosis, which most often consists in a radiological examination, MRI and CT. Methods based on plantoconturography and pedobarography are also ever more frequently applied in order to detect early foot disorders. Pedobarography is an examination which assesses balance, deformities in the shape of the sole, as well as changes in the parameters of gait in RA patients.

Few studies, conducted mostly by the Rehabilitation Clinic of the Medical University of Białystok, are devoted to the examination of foot statics in RA patients. Results obtained so far indicate that it is necessary to extend research in this field. There are still no new findings regarding gait analysis in RA patients or the link between the disturbances of foot statics and gait parameters. Therefore, we undertook a study aimed at determining the changes in foot statics and their impact on gait disturbances in RA patients.

We set ourselves the following objectives:

1. Determining the type and severity of foot deformities based on the analysis of the chosen parameters of foot statics.

2. Determining the impact of the degree of disturbances of foot statics and the disease activity on the duration of the particular phases of gait.

3. Determining the impact of the maximum foot load and the percentage distribution of loads between the forefoot and hindfoot on the duration of the particular phases of gait.

4. Establishing the link between observed disorders and the stage of rheumatoid arthritis.

The study was conducted in the Rehabilitation Clinic of the Medical University of Białystok upon obtaining the consent of the Bioethical Commission (Agreement No. R-I-002/86/2014).

The control group consisted of 41 healthy women, aged 21-71, mean age standing at 47,1 years. The maximum body weight was 95 kg and the minimum was 50 kg, mean body weight amounting to 68,2kg.

RA patients, whose disease had been diagnosed based on the criteria established in 2010 by ACR (the American College of Rheumatology) and EULAR (the European League Against Rheumatism), were divided into three groups.

Group I consisted of 56 women, aged 28-78 (mean age 58,2). The disease duration stood at 1-34 years.

Group II was composed of 28 patients, aged 34-74, in the first and second stage of RA. The disease duration stood at 1-29 years.

Group III comprised 28 patients, aged 28-78, in the third and fourth stage of the disease. The disease duration stood at 1-34 years.

We calculated the disease activity score (DAS 28 index), BMI, and we conducted a pedobarographic examination composed of four parts in all the studied women. Examinations carried out in RA patients included a static test, a dynamic test, a test assessing the shape of their feet, as well as an interview enquiring about the frequency of falls. In the static examination, we located the maximum pressure point, determined the distribution of pressure on the left and right foot, the percentage distribution of loads on each foot, as well as the load on feet measured in kilograms. In the dynamic examination, we determined the maximum load expressed in gr/cm<sup>3</sup>, the percentage distribution of loads on each foot, as well as the duration of the particular gait phases. In the third part of the examination we measured the hallux valgus angle ( $\alpha$ ), the heel angle, the Clarke's angle, the Sztriter-Godunow index and the Wejsflog's index.

The statistical analysis was conducted in two groups by means of the *Kolmogorov-Smirnov test with Lilliefors correction, the Shapiro-Wilk test and the non-parametric Mann-*

*Whitney U test. We also calculated the Spearman's rank correlations coefficient.* In order to analyse the the differences between the results among groups we used the non-parametric Kruskal-Wallis test (ANOVA). The results were considered statistically significant at  $p < 0,05$ . Calculations were performed by means of Statistica 10.0 software produced by StatSoft.

The results obtained in our study revealed the disturbances of the parameters of foot statics in RA patients to be more frequently associated with the Wejsflog's index, the hallux valgus angle ( $\alpha$ ) and the Clarke's angle. These changes demonstrated greater deviations than predicted with regard to the degree of the advancement of changes in the imaging tests, especially in the case of patients with an increased body weight. We also detected a prolongation of gait phases, in particular of the middle position, resulting from the disturbances of statics and the displacement of the maximum foot load both in static and dynamic conditions, especially in patients in the first or second stage of the disease. In patients in the third and fourth stage of the disease, the prolongation of gait phases stemmed mainly from changes in the percentage distribution of loads between the forefoot and hindfoot. Increased activity of the disease constituted an additional factor affecting the prolongation of gait phases in overweight women.

The pedobarographic examination could serve as an additional method of assessing the functional state of the musculoskeletal system in RA patients. The detected disturbances of gait phases may be symptomatic of structural changes in the osteo-articular system.

The results of our tests suggest that changes in foot statics and disturbances in the duration of the particular gait phases constitute an important problem for RA patients. Early diagnosis of these pathologies appears to be vital as it significantly improves patients' quality of life and functional capability.

In the literature published so far, few authors have undertaken studies devoted to the problems connected with the disturbances of foot statics and their impact on the duration of the particular gait phases in RA patients. Research conducted here is innovative, presenting new diagnostic and therapeutic possibilities.