Summary

Analysis of the correlation between factors determining the development of carpal tunnel syndrome in patients with a confirmed diagnosis of the disease using electrophysiological methods.

Carpal tunnel syndrome (CTS), considered the most common mononeuropathy of the upper limb, significantly impacts the patient's quality of life by limiting their manual abilities and the capacity to perform daily life activities.

The aim of this study was to demonstrate differences in the occurrence of the disease among various occupational groups, highlight factors conducive to mononeuropathy development, and present differences in electrophysiological parameters of sensory and motor nerve conduction of the median nerve in the upper limb in patients with CTS. Furthermore, efforts were made to illustrate the influence of chronic diseases on CTS occurrence and evaluate the effectiveness of provocative tests (Phalen, reverse Phalen, Durkan, and Tinel) in diagnosing CTS. Throughout the study, an attempt was made to estimate the average duration of mononeuropathy and assess how the disease duration affects the severity of CTS symptoms. The impact of smoking on CTS occurrence was also examined. Differences in motor and sensory nerve conduction of the median nerve were analyzed based on the progression stages of CTS according to the classification proposed by Whitley and McDonnell.

Each of the patients underwent nerve conduction testing, a comprehensive medical interview was conducted, and provocative tests (Phalen, reverse Phalen, Durkan, and Tinel) were performed. Visual Analog Scale (VAS) was used to measure pain intensity. By analyzing all gathered information, an effort was made to establish correlations between specific risk factors and the occurrence of CTS.

The study involved a group of 100 patients, 88 females and 12 males, aged from 29 to 88 years (mean age 58.64 ± 12.35), diagnosed with CTS, who provided consent to participate in the study. A control group was also included in the study, consisting of 40 individuals, 34

females and 6 males, aged from 26 to 80 years, in whom ENG (electroneurography) testing did not confirm a diagnosis of CTS.

In the study group, 88 (88%) individuals suffered from chronic diseases or injuries. 50% of the patients had hypertension. Obesity was reported by 40% of the patients, while thyroid dysfunction was present in 36% of the participants. Degenerative joint disease was present in 35% of the study population. Both diabetes and a history of wrist injuries were confirmed in 11% of the patients. 9% of the participants revealed a past history of cancer treatment.

Among the provocative tests, the Phalen test proved to be the most effective diagnostic method for CTS, with a correct classification rate of 61%, exhibiting a specificity of 60%. The Durkan test, with an average specificity (70%), ranked as the second most accurate diagnostic method (correct classification rate of 53%). The reverse Phalen test was essentially random (50% correct classification rate), but exhibited high specificity (83%). The Tinel test turned out to be the least effective diagnostic method (45% correct classification rate), while having the highest specificity (95%).

The analysis of the collected data during the research allowed for the following conclusions to be drawn: provocative tests (Phalen, reverse Phalen, Durkan, and Tinel) have moderate diagnostic value in identifying CTS compared to ENG testing. The conducted studies did not confirm a higher occurrence of paresthesia, numbness in hands, and nighttime discomfort in patients with advanced-stage CTS compared to milder stages of the disease. The research indicated that individuals with advanced-stage CTS were more likely to experience sensory disturbances than those with less advanced forms. The studies demonstrated that the severity of CTS did not significantly affect the deterioration of patients' quality of life statistically. Furthermore, it was established that individuals in the advanced age group reported significantly higher pain scores compared to younger individuals, those below 60 years of age. Additionally, the results revealed that patients with obesity exhibited more quantitative symptoms compared to individuals with a normal BMI. Nevertheless, no significant differences in the perceived pain level were detected between patients with a normal BMI and those suffering from obesity. There was also no statistically significant association observed between performing work that required excessive hand strength, computer-related tasks, or work involving precise and repetitive hand movements, and the occurrence of CTS. The average duration of CTS in the study group was over 5 years. The

findings from the research indicate that the longer the duration of mononeuropathy, the more pronounced the symptoms experienced by the patients. Moreover, it has been demonstrated that CTS most commonly affects both hands simultaneously. Analyzing the self-reported concurrent diseases by patients, a statistically significant association was established between the occurrence of arterial hypertension and CTS. However, such a relationship was not confirmed for patients suffering from thyroid dysfunction, diabetes, or obesity. It was noted that the majority of patients consulting in the ENG department had a moderate degree of CTS advancement. It was proven that the monotonous nature of work and the use of vibrating tools may increase the risk of CTS development. On the other hand, there is no evidence linking uncomfortable hand positioning during work, working in low ambient temperatures, repetitive work, or the lack of breaks for hand-relaxing exercises to increased susceptibility to CTS. Smoking was shown to have no impact on the onset of CTS. Additionally, it was not observed that cycling predisposes individuals to a higher incidence of CTS. It was observed that for right-handed patients, CTS most frequently occurs simultaneously in both hands. Meanwhile, for left-handed patients, CTS more often occurred in their left hand, which is their dominant hand. Conducted analyses demonstrated statistically significant differences in most nerve conduction parameters for both motor and sensory fibers of the median nerve, based on the progression stages of CTS, as classified by Whitley and McDonnell.