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## **The summary of the doctoral thesis**

**Title: The analysis of outcomes of surgical treatment of distal radius fracture**

**Intruduction:** The distal radius is the most common location for fracture in humans. The majority of these injuries are treated nonoperatively with closed reduction and cast immobilization. For unstable fractures or when conservative treatment fails, surgery is applicable. Among many surgical methods, fixation with volar locking plates is recently gaining popularity. This technique proved to be effective in treating multiple types of distal radius fracture (DRF), providing not only stable fixation but also promising functional outcomes with reasonable complications risk. However, there is still a lack of scientific data allowing to establish consensus over many remarkable aspects of this treatment, like precise indications, the importance of regaining anatomy, optimal rehabilitation program, or correlation between the range of movement, functional outcome, and satisfaction from treatment.

**Aim:** This study aimed to evaluate the outcomes of DRF treatment among patients who received surgery using volar locking plates in the Department of Orthopedics and Traumatology of the Medical University of Warsaw, specifically to assess the influence of gender, age, health status, fracture pattern, the parameters of surgery as well as a pre-and post-operative course for the satisfaction of the patient, pain, and functional outcome.

**Material and methods:** Adults, who received surgery for DRF using VLP in the Department between February 2020 and September 2021 were eligible for the study. Overall 87 such patients were recognized. Finally, after considering the exclusion criteria, 55 patients were included in the study. The data for the study - medical history, physical examination, and radiological files, were obtained from medical records from a stay in the hospital and follow-up visits in the outpatient clinic (2 and 6 weeks and 3 and 6 months after surgery). Satisfaction measured on a 5-grade Likert scale, pain strength according to VAS and its persistence, and functional outcome according to the DASH scale were considered primary outcome measures. Statistical analysis included: descriptive statistics, comparison of dichotomic variables, change of parameters in time, and analysis of mutual influence between variables. The following statistical methods were used: Shapiro-Wilk test, Q-Q plot, log-linear analysis,  $\chi^2$  test, Fisher's exact test with Bonferroni correction, analysis of variance-repeated measurements, Tukey's posthoc test, logistic regression, odds ratios with 95% confidence intervals, linear regression, quantile regression, histograms, and box-plots. Results with  $p < 0,05$  were

considered significant. The ethical committee of the Medical University of Warsaw has acknowledged the study

**Results:** 81,9% of patients were either satisfied or very satisfied with the treatment. 27,3% of patients experienced complications - most often carpal tunnel syndrome and conflict between the tip of the screws and extensor tendons. The secondary displacement, predominantly minimal, was detected in 16,4% of patients. In all patients, bone growth was achieved, with one person experiencing delayed growth. 87.3% of patients used institutional rehabilitation, with 27.3% reporting that the COVID-19 pandemic hindered their rehabilitation. During the postoperative course, the range of motion of the wrist and forearm significantly increased, reaching an average of 80% (SD=13.9) of flexion, 83.4% (SD=15.1) of extension, 77.3% (SD=20.6) of radial deviation, 82% (SD=13.3) of ulnar deviation, 90.8% (SD=8.3) of internal rotation, 88.9% (SD=13.8) of external rotation, and 70.6% (SD=16.4) of grip strength at the final observation point compared to the healthy side. In addition, there was a significant decrease in DASH scores and pain severity. Greater flexion and extension ranges, as well as stronger grip strength, positively influenced the patient's satisfaction, while complications and fractures on the dominant side negatively impacted it. The DASH score was negatively affected by the patient's age above 65 years, delayed initiation of institutional rehabilitation after surgery, lower achieved grip strength values, and persistence of pain until the end of the observation period. The likelihood of persistent pain was higher in patients with normal body weight than in overweight and obese individuals. Radiological parameters, both concerning the morphology of the fracture as well as the quality of reduction measured according to the AAOS criteria (checking the criterion of volar tilt was not possible), Lidström-Sarmiento, and Soong, did not have a statistically significant impact on the treatment outcome in terms of its primary parameters.

**Conclusions:** Surgery with the use of a volar locking plate is an effective method for treating distal radius fractures, providing stable fixation, high satisfaction, and good functional outcome in most patients, with a low risk of serious complications. Individuals above 65 years old achieved fewer benefits from the operation, compared to younger ones. Avoiding complications, lack of delay in initiation of rehabilitation, and better regain of grip strength, flexion, and extension, were the most important for a satisfactory final outcome. Fracture of the dominant side was related to lower satisfaction, and normal body weight correlated with prolonged pain. Fracture pattern, as well as radiological outcome according to AAOS (2 out of 3 criteria), Lidström-Sarmiento, and Soong criteria, had no significant influence on the final outcome.