Correlation Between the Patient-Rated Wrist Evaluation (PRWE) and Radiologic Parameter In Distal Radius Fracture

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Abstract

Introduction

Distal radius fracture is one of the most commonly seen fractures. It accounted for about 3% of total upper extremity fractures. The radiologic parameter of the distal radius is essential to treatment. Hence, it can also be utilized as a successful indicator after treatment. This study aims to evaluate the correlation between wrist radiologic parameters and patient-rated wrist evaluation.

Methods

This cross-sectional study was carried out from Mei 2021 to December 2021. All patients were consecutively included. The radiological parameter was obtained in all patients as follows radial height, radial inclination, ulnar variance, and volar tilt. Patient-rated wrist evaluation (PRWE) was obtained in all patients. The outcome of interest in this study was the correlation between radiographical parameters and Patient-Rated Wrist Evaluation (PRWE).

Result

A total 40 patients were included in this study. The mean age of the included patients was 40,88 $\pm$ 16,45. Ulnar variance was statistically significant correlated with the PRWE with p=0.001, r=0.634. Meanwhile, the other radiologic parameters showed no correlation to the PRWE.

Conclusion

This study showed the correlation between ulnar variance and PRWE in distal radius fracture. Addressing contralateral ulnar variance and the other radiologic parameters were recommended to achieve the optimal functional wrist outcome.

Keyword: Distal radius; Ulnar variance; Radiologic parameter; Patient-Rated Wrist Evaluation

1. Introduction

Distal radius fracture is one of the most commonly seen fractures. It accounted for about 3% of total upper extremity fractures. The incidence of distal radius fracture was about 640.000 cases per year.(Nellans, Kowalski, and Chung 2012) Management of distal radius fracture remains debatable between closed reduction followed by cast and surgical intervention. Intraarticular extension of distal radius fracture was noted at about 50-81%.(Katz et al. 2001) However, closed reduction and casting do not provide optimal alignment of the articular surface.

The radiologic parameter of the distal radius is essential to deciding whether operative or non-operative treatment. Hence, it can also be utilized as a successful indicator after treatment. Theoretically, the abnormal value of radial length, radial inclination, volar tilt, and ulnar variance indicate unstable distal radius fracture.(Austine et al. 2020) It will cause persistent pain and functional disturbances. However, the specific radiologic parameter to predict the functional wrist outcome remains debatable. This study aims to evaluate the correlation between wrist radiologic parameters and patient-rated wrist evaluation.

2. Methods

This cross-sectional study was carried out from Mei 2021 to December 2021. All patients were consecutively included. The inclusion criteria were (1) all patients that presented with distal radius fracture, including extra-articular and intra-articular; (2) Underwent open reduction and internal fixation using plate and screw; (3) At least

six months after surgical procedure; (4) Type 1 and 2 open fracture without tendon injury; (5) Age above 18 years old. The exclusion criteria were (1) patients that presented with comorbid conditions, such as rheumatoid arthritis, neurological disorder, tendon injury, congenital abnormality, and mental disorder; (2) open fracture in both extremities; (3) pre-operative or post-operative infection.

The radiological parameter was obtained in all patients as follows radial height, radial inclination, ulnar variance, and volar tilt. Patient-rated wrist evaluation (PRWE) was obtained in all patients. The outcome of interest in this study was the correlation between radiographical parameters and (PRWE).

Data analysis was conducted using SPSS v25.0. The Kolmogorov-Smirnoff test was used to assess the normality of data distribution. Pearson or Spearman correlation was used to assess the correlation between the radiologic parameters and PRWE.

3. Result

A total 40 patients were included in this study with 20 males and 20 females. All included patients underwent open reduction and internal fixation. The mean age of the included patients was 40,88 $\pm$ 16,45. The characteristics of the radiologic parameters were shown in Table 1.

Table 1. Characteristic of the included patients

Variable	n	%
Gender		
Males	20	50%
Females	20	50%
Age (years)	14,25 [9,5 – 38]	
PRWE	4 [0 – 15]	
Radial Height (mm)	18,5 [7 – 40]	
Radial Inclination (°)	1 [(-3) – 8]	
Ulnar variance (mm)	15 [3 – 38]	
Volar tilt (°)	14,25 [9,5 – 38]	

The correlation between radiologic parameter and the PRWE was assessed using spearman correlation. It was shown in Table 2.

Table 2. Correlation between radiologic parameter and PRWE

Variable	r	p-value
PRWE – Radial Height	0,097	0,551
PRWE – Radial Inclination	-0,179	0,27
PRWE – Ulnar Variance	0,634	0,001
PRWE – Volar Tilt	0,33	0,839

4. Discussion

This study showed a correlation between PRWE and radiologic parameter of distal radius. Four radiologic parameters were assessed in this study. Ulnar variance was statistically significant correlated with the PRWE with p=0.001, r=0.634. It showed moderate correlation while the other parameters did not show any correlation to the PRWE.

Previous study observed a correlation between distal radius radiologic parameter and PRWE.(Plant, Parsons, and Costa 2017) The result showed that there was a correlation between palmar tilt and PRWE with p=0.001, r=0.47. However, their study did not show any correlation between ulnar variance and PRWE with p=0.63, r=0.08 in 3 months of follow up. Vinicius et al.(Paranaíba et al. 2017) also showed that radiologic parameters did not have any correlation with PRWE after 1 year follow up. Anzarut et al.(Anzarut et al. 2004) did not show any correlation between volar tilt and functional wrist outcome.

On the other hand, Hohmann et al.(Hohmann et al. 2017) showed a correlation between palmar tilt and PRWE with p=0.001 and r=0.24. Meanwhile, ulnar variance was correlated with the grip strength with p=0.001 and r=0.61. Cai et al.(Cai et al. 2015) also showed a correlation between radial height and volar tilt in terms of

Disabilities of the Arm, Shoulder and Hand (DASH) score. Kodama et al.(Kodama et al. 2014) also showed a correlation between volar tilt and ulnar variance to the DASH score.

The ulnar variance was correlated with PRWE in distal radius fracture. Several studies also showed radiologic parameters were correlated with wrist functional outcome. This study aids to achieve optimal functional outcome in distal radius. The authors suggest to obtain the healthy wrist x-ray to address the normal radiologic parameters in each patients.

However, the outcome discrepancies among the studies may be caused by different of scoring modalities. Also, the treatment of the included patient was varied. The radiologic parameter was assessed in different duration post-operatively.

5. Conclusion

This study showed the correlation between ulnar variance and PRWE in distal radius fracture. Addressing contralateral ulnar variance and the other radiologic parameters were recommended to achieve the optimal functional wrist outcome.

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