

CHAPTER V

DISSCUSSION



Discussion

Colles' fractures are common, especially in elderly patients. Initial treatment consists of closed manipulation and immobilization. With increasing knowledge and understanding of fracture patterns, such as unstable fractures and the long-term effects of malunion, however, a more aggressive surgical approach has been used for potential unstable fractures⁽¹⁴⁾. Redisplacement is still a common problem in conservative treatment of Colles' fracture. From the result of our study, there was an increasing of dorsal tilt angle in 50 out of 63 Colles' fractures. The mean of dorsal tilt angle increased from -0.70 degrees after reduction to 8.71 degrees at the end of immobilization, nearly the same as a previous study.⁽²²⁾

According to the size of dorsal cortical bone defect, the importance of dorsal cortical comminution in predicting redisplacement of dorsal tilt angle may be owing to the fact that the dorsal cortical bone acts like the key stone of a Roman arch. Cortical bone comminution has long been known to cause the failure of immobilization. Hasting⁽²⁹⁾ recommended pin fixation or external fixation for dorsal comminution that exceeded 50% of the dorsal-to-volar diameter. Several classifications have already included presence or absence of dorsal cortex comminution into their classifications, such as AO classification and Oder's classification, while the others do not. Only recently, the work of Flinkkila⁽³⁰⁾ has showed the correlation between redisplacement of dorsal tilt angle of the radius and the quantitative volume of cancellous bone defect. According to the results of our study, we were able to show the correlation between the size of cortical bone defect, measured in degrees, and redisplacement belonging to dorsal tilt angle of Colles' fracture with the use of plain wrist radiography. The coefficient of partial correlation of 0.177 between size of dorsal cortical bone defect and rechanging of dorsal tilt angle showed the same direction with redisplacement of dorsal tilt angle. This result also confirmed the finding of other studies about dorsal cortex comminution and instability of Colles' fractures using different approaches.^(15, 28, 30, 32, 37)

According to the patients' age, for the coefficient of partial correlation of 0.202, patients' age showed a higher figure than size of dorsal cortical bone defect. The relationship between age of the patient and redisplacement of Colles' fracture has been shown by many previous studies.^(7, 9, 28, 31, 37) The mean of dorsal tilt angle after reduction of Colles' fractures of patients 60 years old in our study did not have statistically significant difference from the mean of dorsal tilt angle after reduction of Colles' fractures of patients less than 60 years old patients. But at the end of immobilization, the means of both dorsal tilt angle and redisplacement of dorsal tilt angle of 60 years old patients had statistically significant difference from the ones of less than 60 years old patients. Considering Colles' fracture as an indicator of osteoporosis^(2, 38), our study did not find the statistically significant difference of means of size of dorsal cortical bone defect between the age groups of 60 years old or more, or less than 60 years old.

According to patients' gender, in our study, patients' genders were methodological divided into two groups; male = 0 and female = 1. The coefficient of partial correlation of gender of Colles' fracture patients for redisplacement of dorsal tilt angle was -0.207. The direction and the magnitude of redisplacement of dorsal tilt angle found in our study show that, for the female patient, controlled for other variables such as dorsal cortical bone defect and age, should have approximately 8 degrees redisplacement of dorsal tilt angle less than the equivalent male patient. Interestingly, there was no statistically significant difference of means of radiographic parameters of before and after reduction and dorsal tilt angle at the end of immobilization between male and female patients in our study. It showed that gender is one of the predicting factors of redisplacement of dorsal tilt angle of Colles' fracture in which males had worse prognosis than females, in contrast to previous studies.^(19, 31)

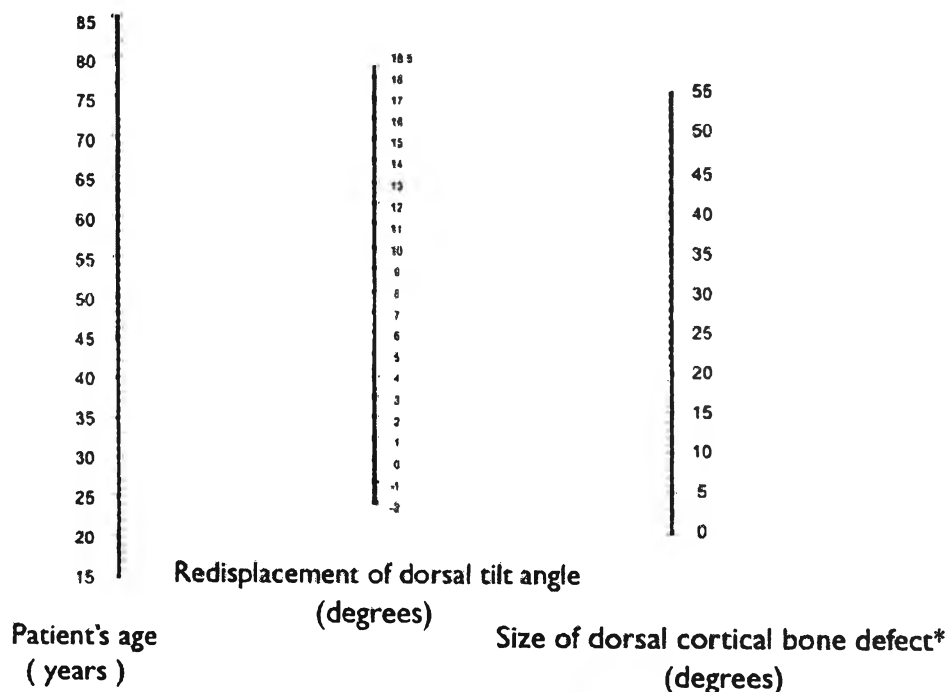
According to the radioulnar index difference, the radioulnar index difference between before and after reduction was not found to be one of the predicting factors. Radial axial shortening has been studied with a different methodology and found to be one of the predicting factors^(18, 28, 37), not similar to our study.

According to the multiple regression analysis, there were some drawbacks. Firstly, the constructed equation from multiple regression analysis was largely affected by the abnormally high or low value data from the sample. Secondly, the independent

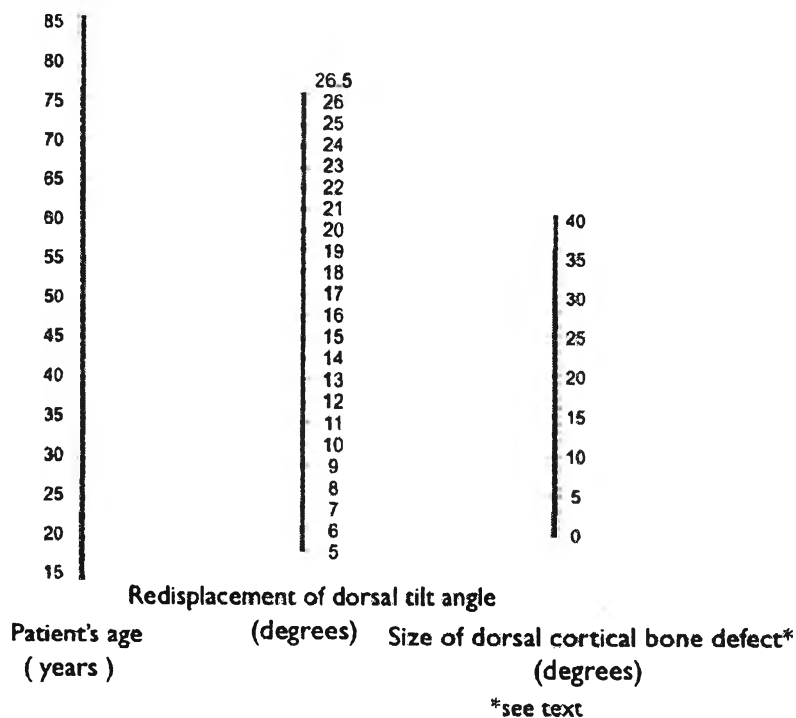
variables used in our study (size of dorsal cortical bone defect, and patients' age and gender) were the mediators for the redisplacement of dorsal tilt angle of Colles' fracture, not the causative agents, unless proved otherwise by future research. Thirdly, the constructed equation we created had the power or multiple coefficient of determination of 26% to predict the redisplacement of dorsal tilt angle of Colles' fracture at the end of immobilization. The remaining 84% is still unknown. Fourthly, the findings from our study had certain limitations. According to our data, range of patients' age was from 15 to 82 years old and range of size of dorsal cortical bone defects was from 0 to 49 degrees. The attending physician should notice that our constructed normogram could not be used to predict redisplacement of dorsal tilt angle at the end of immobilization of Colles' fracture in the patients whose age or size of dorsal cortical bone defect or both are out of range of our sample. Lastly, we had already validated our constructed equation with the other group of 12 extra articular fractures of distal radius. There was no statistically significant difference between means of observed and calculated dorsal tilt angle at the end of immobilization. We noticed that in 10 cases, the calculated dorsal tilt angles were higher than the measured angle. In the real clinical scenario, predicted dorsal tilt angle at the end of immobilization of Colles' fracture would be rather an overestimated value.

To eliminate steps of calculating redisplacement of dorsal tilt angle from variable from dorsal cortical bone defect, and patients' age and gender, and to simplify the constructed equation for clinical use, we made the gender-specific normograms to predict the redisplacement of dorsal tilt angle of Colles' fracture at the end of immobilization.

Female normogram



Male normogram

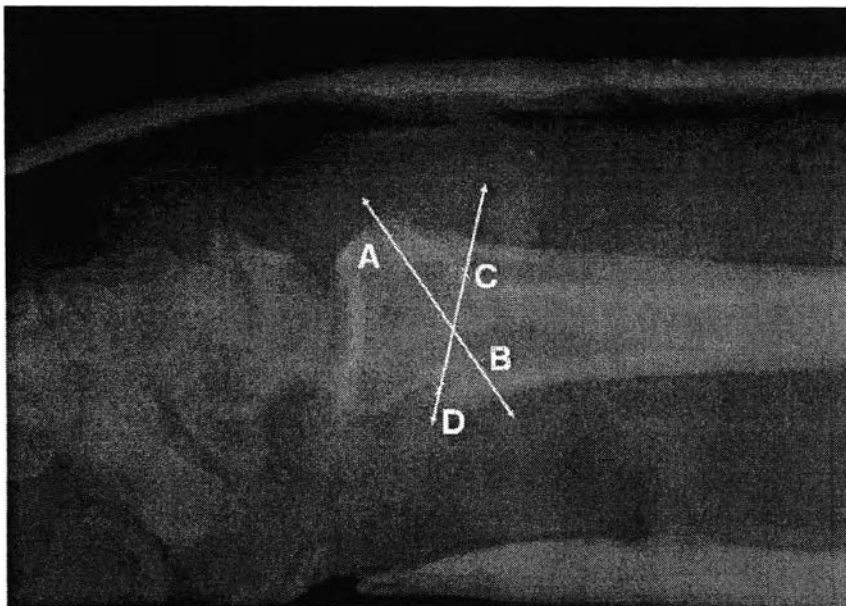


Instructions for use**Limitations**

1. Age range: 16 - 82 years old (female), 15 - 71 years old (male)
2. Size of dorsal cortical bone defect range : 0 - 49 degrees (female), and 0 – 37 degrees (male)

Size of dorsal cortical bone defect measurement

1. Size of dorsal cortical bone defect is measured on lateral radiograph of wrist joint after reduction.
2. Size of dorsal cortical bone defect is the angle under dorsal cortical bone defect, formed by line AB intersected with line CD.
3. Size of dorsal cortical bone defect is measured in degrees.



A : the most distal point of intact dorsal cortex of distal fragment

B : the most distal point of intact volar cortex of distal fragment

C : the most proximal point of intact dorsal cortex of proximal fragment

D : the most proximal point of intact volar cortex of proximal fragment

Estimation of redisplacement of dorsal tilt angle

1. Marked patient's age on patient age scale on the left hand side (gender-specific)
2. Marked size of dorsal cortical bone defect on size of dorsal cortical bone defect scale on the right hand side
3. Drew a straight line connecting points of step 1 and step 2
4. Predicted redisplacement of dorsal tilt angle is the point on redisplacement scale in the middle column intersected by the line of step 3, measured in degrees.

Estimation of dorsal tilt angle of Colles' fracture at the end of immobilization

1. Measured the dorsal tilt angle of Colles' fracture on lateral radiograph of wrist joint after reduction
2. Add predicted redisplacement of dorsal tilt angle to 1 to make the dorsal tilt angle of Colles' fracture at the end of immobilization