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The interobserver and intraobserver reliability of the Fernandez classification of distal radius fracture

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Abstract

Background: With increasing knowledge concerning fractures of the distal radius, different classifications have been proposed. Reliability of most of these classifications has been assessed. The Fernandez classification has never been assessed for intraobserver and interobserver reliability, although this classification is commonly used.

Methods: Five observers including one attending orthopaedic hand surgeon, one hand surgery fellow, two attending orthopaedic surgeons and one senior resident of orthopaedic surgery classified 42 standard anteroposterior and lateral radiographs of prereduction distal radius fractures. Four weeks later the radiographs were renumbered differently and reviewed and classified by the same observers. Reliability of classification was assessed by Kappa value.

Results: The mean intraobserver Kappa value was 0.64 (0.53-0.73), indicating good or substantial reliability, while the mean interobserver reliability was 0.45(0.30- 0.71) representing moderate reliability.

Conclusion: In contrast to previous classifications of distal radius fracture, which their intraobserver and interobserver reliabilities were poor or moderate in most studies, the Fernandez classification has good intraobserver reliability and moderate interobserver reliability, so it can be used by orthopaedic surgeons with more confidence.

Key words: distal radius fracture, Fernandez classification, reliability.

Introduction

The management of acute distal radius fracture remains controversial, with no universally accepted criteria for operative or non operative treatment. The management of this fracture is often determined by the fracture pattern, and therefore, classifications can be very useful. As new information becomes available relative to pathogenesis, treatment and prognosis, new classifications have emerged. Many classification systems have been recommended for explaining the fracture patterns and predicting outcomes for patients with distal radius fractures. The Frykman, Melone, Mayo, AO, Cooney and Fernandez are the most common classification systems mentioned in the literature. Each of these systems was popular in a period of time. A fracture classification system should be reliable and valid. It should also have prognostic value to assist physicians in planning the managements [1,2]. The interobserver and intraobserver reliability of the Frykman, Melone, Mayo, AO and Cooney classification systems have been assessed by numerous studies. The Fernandez classification system has

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Kappa value	Strength of agreement
≤ 0.20	Poor
0.21 – 0.40	Fair
0.41 – 0.60	Moderate
0.61 – 0.80	Good
0.81 – 1.00	Very good

Table 1. Interpretation of Kappa value.

been developed in recent years and is based on the mechanism of injury [3]. The aim of this study was to assess interobserver and intraobserver reliability of the Fernandez classification of distal radius fracture which to our knowledge has not been assessed before.

Methods

The prereduction radiographs of anteroposterior and lateral view of 42 acute distal radius fractures were used to assess the Fernandez classification. We did not use adjunctive studies, such as computed tomography or MRI. One attending orthopedic hand surgeon, one hand surgery fellow, two attending orthopedic surgeons, and one senior resident of orthopedic surgery served as observers. All of them were familiar with this classification because we usually use it in our hospital. Diagrams of classification as well as written text explaining the classification were made available before and during each reading to ensure that all observers were using the fracture classification in the same manner. Names and identifying marks on the radiographs were covered, and they were randomly numbered. The observers were blinded to each others' results. All radiographs were read by all 5 observers. Then the films were randomly renumbered for a second reading, which was performed after 4 weeks from the first reading. Again, diagram and explanation of the classification accompanied the radiographs to be read. None of the observers were aware of their previous classification. Data were analyzed by calculating the Kappa values for interobserver and intraobserver agreement to indicate the reliability of the classification. A Kappa value of one represents perfect agreement and 0 represents no more agreement than would be expected by chance; a Kappa of -1.0 indicates complete disagreement [4] (Table 1).

Results

The mean intraobserver Kappa value was 0.64 (0.53-0.73), indicating good or substantial reliability (Table 2), while the mean interobserver reliability was 0.45(0.30- 0.71) representing fair to moderate reliability. Interobserver reliability between attending hand surgeon and hand surgery fellow was 0.71 while it was fair and moderate between other observers. It seems that the interobserver reliability can be improved by further training (Table 3).

Discussion

The aim of this study was to assess the interobserver and intraobserver reliability of this classification system which is based on the mechanism of injury [3]. It has been mentioned that, a classification based on the mechanism of injury is preferred because the associated ligamentous lesions, subluxations, and fractures of the neighboring carpal bones, as well as concomitant soft tissue damage are directly related to the quality and degree of violence sustained [3]. In addition knowledge of the mechanism of injury facilitates manual reduction through the

Observer	Kappa value
Obs. 1· Attending orthopedic hand surgeon	0.67
Obs. 2· Hand surgery fellow	0.66
Obs. 3· Attending orthopedic surgeon	0.59
Obs. 4· Attending orthopedic surgeon	0.53
Obs. 5· Senior resident of orthopedic surgery	0.73

Table 2. Intraobserver agreement (Kappa value).

	obs. 1	Obs. 2	Obs. 3	Obs. 4	Obs. 5
Obs. 1		0.71	0.51	0.31	0.46
Obs. 2			0.56	0.36	0.50
Obs. 3				0.30	0.43
Obs. 4					0.37
Obs. 5					

Table 3. Interobserver agreement (Kappa value).

application of a force opposite to the one that produced the injury [3]. According to this classification system, the fractures of the distal radius may be divided into the following five types [3].

Type I **:** Fractures are bending fractures of the metaphysis in which one cortex fails to tensile stresses and the opposite one undergoes a certain degree of comminution (extraarticular Colles' or Smith's fractures).

*Type II***:** Fractures are shearing fractures of the joint surface (Barton's. reversed Barton's, and radial styloid fractures).

*Type III***:** Fractures are compression fractures of the join surface with impaction of the subchondral and metaphyseal cancellous bone. Current terms used for this type are intra articular comminuted fractures, complex articular fractures and pilon radial fractures.

*Type IV***:** Avulsion fractures of ligament attachments, includes ulnar and radial styloid fractures associated with radiocarpal fracture-dislocations.

*Type V***:** Fractures are high-velocity injuries that involve combinations of bending, compression, shearing, and avulsion mechanisms or bone loss.

These groups can easily be recognized with standard anteroposterior and lateral radiographs of the wrist [3]. The reliability studies were done to evaluate indirectly the validity of the classifications [5]. Reliability means that various observers should be able to produce the same results using the same classification system, or an observer should be able to obtain consistent results classifying the same fractures at different times [5]. The consistency of the AO classification of distal radius fracture has been analyzed previously [6]. The interobserver and intraobserver reliability of the Frykman, Melone, Mayo, and AO classifications also were assessed by studies but neither classification system was found to be reliable [7,8]. The reliability of the Cooney classification has been assessed recently [9]. According to this study interobserver and intraobserver reliability of classification with group were moderate and substantial, but decreased when fractures were classified with subgroup. Therefore, the reliability of the Cooney classification system cannot be warranted [9]. To the best of our knowledge, of the numerous classification systems applied to the distal radius fracture, Fernandez classification has never been tested for intraobserver and interobserver reliability, although this classification is commonly used. We found that the intraobserver and interobserver reliability of the Fernandez classification system are good and moderate respectively, better than previously studied classification systems. The interobserver reliability can be improved with further training. We did not support plain radiography with computed tomography to assess the role of computed tomography in improving the reliability of classification and this can be a limitation of our study.

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