

Assessment of interobserver variation in Garden classification and management of fresh intracapsular femoral neck fracture in adults

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【Abstract】 Objective: To assess the interobserver agreement on Garden classification of fresh femoral neck fracture and management plan based on anteroposterior (AP) view and also assess if the addition of lateral view changes the classification and management plan.

Methods: Ten orthopaedic surgeons were asked to classify 35 femoral neck fractures on AP view only and propose the management plan. Then the same films were reshown in conjunction with their lateral view after 10 days. Results were compared with respect to the classification and management plan between two groups. Interobserver agreement was calculated using Fleiss' kappa.

Results: There was only a fair interobserver agreement (kappa value 0.39) on Garden classification

on AP view only which improved to moderate agreement (kappa value 0.52) after adding a lateral view. While there was only a slight improvement in the interobserver agreement on the management plan on AP view only (kappa value 0.50) and AP combined with lateral views (kappa value 0.52). Supplementation of the lateral view changed the classification in 15.42% of the cases and altered the management plan in 23.14% of the cases.

Conclusion: We conclude that lateral view should be obtained routinely on all patients with suspected femoral neck fracture as it definitely has a role in planning treatment of femoral neck fracture.

Key words: *Classification; Disease management; Femoral neck fractures; X-rays*

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The Garden classification^{1,2} is the most accepted classification by majority of orthopaedic surgeons in treating fresh femoral neck fracture (less than 3 weeks) in adults. This classification is based on a single anteroposterior (AP) view of the involved hip. This limits the observer to differentiate displaced from undisplaced fractures. A fracture appearing undisplaced in an AP view may actually be displaced in a lateral view or vice versa. Obtaining an additional lateral view with an AP view may provide the treating surgeon with more reference in terms of classification and planning/modifying treatment. However the role of lateral view is still not clearly defined in literature.³⁻⁵

The aim of this study is to assess the interobserver agreement on Garden classification of fresh femoral neck fracture and the management plan based on AP view only and also assess if the addition of lateral view changes the classification and management plan.

METHODS

This study was conducted in the departments of orthopaedics and radiology of a tertiary care centre from October 2010 to March 2012. Totally, 35 young adults (18-50 years) of either sex with fresh femoral neck fracture (less than 3 weeks) were included. Patients with a pathological fracture were excluded from the study. Ethical clearance was obtained from the ethical committee of the institution. An informed consent was taken. Patient related data including name, age and sex were documented and kept confidential.

All the patients were subjected to X-ray of pelvis and AP view of bilateral hips (with 20°

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internal rotation) and a cross-table lateral view of the affected hip joint. In the initial step only the AP radiographs (numbered 1-35) were shown independently to 10 qualified orthopaedic surgeons (observers). The observers were asked to complete a questionnaire about Garden classification and propose management plan. The options for management plan were multiple cannulated cancellous screw fixations, sliding hip screw with or without anti-rotation screw, valgus osteotomy, open reduction and muscle pedicle bone graft.^{6,7}

In the second step the AP radiographs were numbered differently and presented with an additional lateral view for review by the same group of surgeons. They were asked to fill the same questionnaire again. A 10 days gap was ensured between the two reading sessions to minimize the bias.

The kappa coefficient was used to evaluate interobserver agreement beyond chance. Due to multiple observers on two sessions, a multiple rater formula described by Fleiss⁸ was used. The result of this formula correlates with the average kappa value of each possible combination of observers. The kappa coefficients were interpreted according to Landis and Koch grading⁹: <0.20 defined as poor, 0.20-0.40 fair, 0.41-0.60 moderate, 0.61-0.80 substantial, 0.81-1.00 perfect. The percentage change in the classification as well as management plan was also calculated following addition of a lateral view to the AP view of involved hip.

RESULTS

There were 24 males (69%) and 11 females (31%) in study population. The male to female ratio was 2.2:1.

A total of 350 observations (10 observers reviewing 35 films each) for each Garden classification and management plan on AP view only and on AP combined with lateral views were available for analysis.

After viewing the additional lateral view, the observers changed their proposed classification in 54 out of 350 observations (15.42%) and changed

their proposed management plan in 81 out of 350 observations (23.14%, Table 1). Number of changed Garden classification per observer ranged from 2 to 9 (median 5.5). Number of changed management plan per observer ranged from 1 to 12 (median 9).

The kappa value of interobserver agreement on the Garden classification on AP view only was 0.39 (fair agreement) and on AP combined with lateral views 0.52 (moderate agreement). There was improvement in agreement (from fair to moderate) on Garden classification with the addition of a lateral radiograph.

The kappa value for interobserver agreement on the management plan on AP view only was 0.50 (moderate agreement) and on AP combined with lateral view 0.52 (moderate agreement). Thus there was only a slight improvement in agreement on management plan with the addition of a lateral radiograph.

Table 1. Number of changed Garden classification and management plan after adding lateral view to AP view

Observer (No.)	Number of changed Garden classification	Number of changed management plan
1	4	1
2	4	8
3	6	8
4	2	12
5	9	7
6	6	3
7	5	10
8	6	11
9	8	10
10	4	11
Total	54	81

DISCUSSION

The appropriate management of femoral neck fracture broadly consists of internal fixation with or without augmentation or replacement arthroplasty.⁶

Frandsen et al¹⁰ concluded that it was difficult to reliably delineate the four classification stages in the Garden classification. No formal statistical

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