Lauge-Hansen classification of malleolar fractures

An assessment of the reproducibility in 118 cases

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The radiographs of malleolar fractures in 118 consecutive patients were assessed by 4 observers using the Lauge-Hansen classification. The interobserver variation was large; only 51 of the 118 radiographs were classified identically by all 4 observers. With the purpose of assessing intraobserver variation, the same observers classified the same radiographs 6 weeks later. The first and the second classification were identical in 75–97 of 118 radiographs (64–82 percent). These results show that the Lauge-Hansen system is difficult to apply in a reproducible way.

The Lauge-Hansen (1942, 1954) classification of malleolar fractures has been recommended by several authors (Burwell and Charnley 1965, Cedell 1967, Yde 1980, Lindsjö 1985), and it is widely used in Scandinavia. Lindsjö (1985) made a comparison between 6 different patient materials classified according to Lauge-Hansen and found a great variation in the frequency of the different fracture types. The sources of this variation were not clear, but Lindsjö assumed that different selection criteria played a major role.

We have studied interobserver and intraobserver variation in the Lauge-Hansen classification system.

Patients and methods

Totally, 138 consecutive patients older than 18 years with malleolar fracture were admitted to our department in 1987. Preoperative radiographs of 118 patients were available for the study. Each set of radiographs was classifiable according to the Lauge-Hansen system.

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There were 4 observers, all orthopedic surgeons: 1 consultant, 2 senior registrars, and 1 registrar. All 4 observers were familiar with the Lauge-Hansen classification. A special form was made, and each observer was asked to classify the fractures by class and stage according to the Lauge-Hansen system, i.e., supination-adduction fractures (Stages 1–2), supination-eversion fractures (Stages 1–4), pronation-abduction fractures (Stages 1–3), and pronation-eversion fractures (Stages 1–4). The observers worked independently of one another. By comparing the results of the 4 observers, interobserver variation could be assessed.

Six weeks later, the same radiographs were again presented to the 4 observers, but in a new and random order. A new classification was made, and a comparison of the first and second assessment of each observer gave a measure of intraobserver variation.

Results

Only 51 fractures (43 percent) were classified identically by all 4 observers. Gjørup (1988) recommended the pairwise comparison of observers as the most relevant. With 4 observers, we have 6 possible pairs of observers with agreement in 72–77 fractures (61–65 percent; Figure 1).

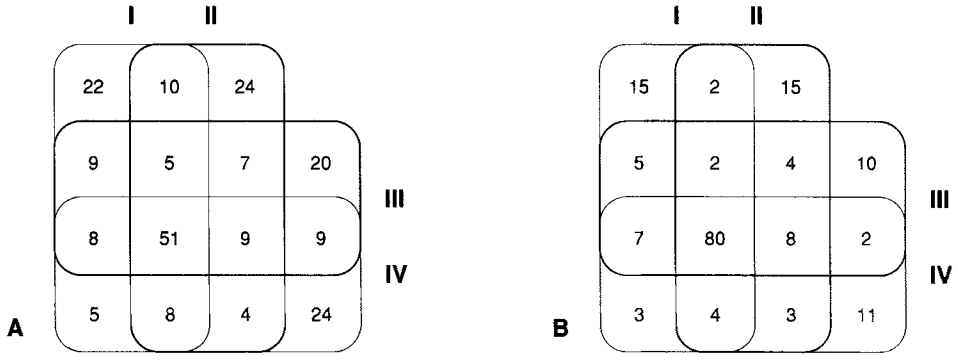

Figure 1. Venn diagram showing the agreement between 4 observers assessing Lauge-Hansen classification in class and stage (A), and in class (B) in 118 malleolar fractures. Figures represent number of fractures.

Table 1. The orthopedic experience related to the individual agreement between first and second assessments in 4 observers' Lauge-Hansen classification of 118 malleolar fractures into class and stage and into class alone

Observer	Years of orthopedic experience	Identical classification (N 118)	
		Class and stage	Class alone
I	10	79	96
II	10	75	103
III	7	89	103
IV	4	97	112

The agreement rates were greater when assessing only class, i.e., neglecting the stage: 80 fractures (68 percent) were classified identically by all 4 observers, and there was pairwise agreement in 75–82 fractures (75–82 percent). Intraobserver agreement ranged from 75 to 97 fractures (64 to 82 percent) using both class and stage, and from 96 to 112 fractures (81 to 95 percent) using class alone. Seniority did not decrease intraobserver variation; in fact, the lowest variation was found for the least experienced surgeon (Table 1).

Discussion

The Lauge-Hansen classification of malleolar fracture seemingly consists of four well-defined classes, each with well-defined stages. However, our results show a poor reproducibility in delimiting the different classes and stages.

Like many diagnostic procedures, it may be difficult or impossible to establish the accuracy of a classification system. Therefore, one has to instead assess reproducibility. Because we had no true fail classification, we were not able to decide for what types of fracture there was maximal agreement and/or maximal disagreement.

In the literature, there is no earlier study of the observer variation in the Lauge-Hansen classification. Frandsen et al. (1988) made an interobserver variation study of the Garden classification of femoral neck fractures and found an agreement rate of 22 percent between 8 observers. Wright and Acheson (1970) studied the interobserver variation in the assessment of arthrosis in radiographs of the hands, and they found that the 3 observers agreed in 68 percent of the cases and that the percentage of diseased joints ranged from 6 to 15 for the 3 observers. These results accord with the low interobserver agreement in our study. Our findings may partly explain that there is a great variation in the frequencies of different types of malleolar fractures classified according to the Lauge-Hansen system in different patient materials (Lindsjö 1985).

The Lauge-Hansen classification is well defined; but it is not clear-cut, for pronation-abduction fractures Stages 1 and 2 are identical to pronation-eversion fractures Stages 1 and 2 (Yde 1980). This, of course, creates some observer variation; but in our material, these fractures were relatively few, and therefore can only explain some of the disagreement found.

Intraobserver variation was lower than interobserver variation, but this is generally less clinically important than interobserver variation (Gjørup 1988). It also suggests that different observers apply

the Lauge-Hansen classification differently. The lowest intraobserver variation in the least experienced surgeon is noteworthy.

The great interobserver variation found in the evaluation of radiographs stresses the need of a careful clinical examination before choosing therapy. It is well known that in some stage of the Lauge-Hansen system ligamentous disruptions, not visible on the radiographs, can be deducted by help of the classification system. The treatment decision, however, must be based on an assessment of the stability, and necessitates clinical examination.

Gjørup (1988) emphasized the variability among observers in different hospitals and departments, and therefore concluded that more than 1 observer variation study is necessary before any definite conclusions can be drawn about the reproducibility of an examination method. This also applied to the present study of the Lauge-Hansen classification system.

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