

Evaluation of knee ligament surgery results with special emphasis on use of a scoring scale

JACK LYSHOLM,* MD, AND JAN GILLQUIST, MD

From the Institution of Surgery, University Hospital, Linköping, Sweden

ABSTRACT

We have designed a scoring scale for knee ligament surgery follow-up emphasizing evaluation of symptoms of instability. Instability is defined as "giving way" during activity. Our scoring scale was compared to a slightly modified Larson scale in patients with anteromedial and/or anterolateral instability, posterolateral and straight posterior instability, chondromalacia patellae, and meniscus lesion. The two scales gave basically the same results in patients with meniscus rupture. In patients with unstable knees, the new scale gave a significantly lower total score. Thus, the new scale evaluates functional impairment due to clinical instability better than the modified Larson scale. The total score, with the new scoring scale, corresponded to the patients' own opinion of function and to the presence or absence of signs of instability.

Since the beginning of the century, an increasing number of researchers have presented their results of knee surgery. Their methods of evaluation have been almost as numerous. Many have graded their results as excellent, good, fair, and poor. Other grading systems reflect both the patients' complaints and the findings on clinical examination. Returning to competitive sport has been used by some as a criterion of good result.¹⁻¹² O'Donoghue¹³ calculated the "percentage of recovery" from answers to a questionnaire. Greens et al.,¹⁴ and Larson¹⁵ introduced the use of a knee-scoring scale. Other knee-scoring scales have been presented by Kettelkamp and Thompson,¹⁶ Marshall et al.,¹⁷ and Turba et al.¹⁸ A slightly modified Larson scale was used by Oretorp et al.¹⁹ in a review of pes anserinus transfer.

The object of this study is to show the need for

different scoring scales, rather than one generally applicable, in the evaluation of results after treatment of different knee disorders. A scoring scale intended for evaluation of knee ligament surgery is presented.

MATERIALS AND METHODS

The original Larson¹ scale consists of 15 items. Four were excluded in the Oretorp modification,¹⁹ namely genu varum or valgum, genu recurvatum, flexion contracture, and patellar abnormality, altogether representing 5 points of the total 100. The remaining 11 items are shown in Table 1.

We introduced the item "instability" in our scoring scale and defined it as "giving way," because this is an important part of the disability caused by anterior cruciate ligament tears.^{4, 20, 21} Using Larson's basic features of distribution of points throughout the scale, we wished to define the lowest activity level needed during walking, running, or jumping to produce giving way or pain (30 points each) and swelling (10 points; Table 1).

To test our scoring scale, we used it alongside Oretorp's slightly modified Larson scale¹⁹ in four groups of patients:

- Patients with knee ligament injury and anteromedial, anterolateral, or combined anteromedial and anterolateral rotatory instability.
- Patients with knee ligament injury and posterolateral rotatory or straight posterior instability.
- Patients with meniscus tears.
- Patients with chondromalacia patellae.

The differences between the two scales in these groups of patients were analyzed statistically with regard to total score and each individual item in order to explain the differences in characteristics between the scales and to establish value, in points, of the different items. The reproducibility of our scale also was analyzed.

The scoring scale records were filled in with the patients' collaboration. The diagnoses were established at clinical examination under anesthesia and arthroscopy.

We also compared the results of our scoring scale with the

* Address correspondence to: Jack Lysholm, MD, Department of Orthopedic Surgery, University Hospital, S-581 85 Linköping, Sweden.

TABLE 1
The modified Larson scoring scale (left column) and our scoring scale (right column)

Function (55 points)		Limp (5 points)	
<i>Gait (10 points)</i>		None	5
<i>Limp:</i>		Slight or periodical	3
None	5	Severe and constant	0
Slight	3		
Marked	0	Support (5 points)	
<i>Support:</i>		Full support	5
Full support	5	Stick or crutch	3
Stick or crutch	3	Weight bearing impossible	0
Weight bearing impossible	0		
<i>Activities (45 points)</i>		Stairclimbing (10 points)	
<i>Stairs:</i>		No problems	10
No difficulty	10	Slightly impaired	6
Slight difficulty	6	One step at a time	2
One step at a time	2	Unable	0
Unable	0		
<i>Squatting:</i>		Squatting (5 points)	
No difficulty	5	No problems	5
Slight difficulty	4	Slightly impaired	4
Not past 90°	2	Not past 90°	2
Unable	0	Unable	0
<i>Walking</i>		Walking, running and jumping (70 points)	
Unlimited	20	<i>A. Instability:</i>	
More than 2 km	15	Never giving way	30
1-2 km	5	Rarely during athletic or other severe exertion	25
Unable	0	Frequently during athletic or other severe exertion (or unable to participate)	20
<i>Running</i>		Occasionally in daily activities	10
No difficulty	5	Often in daily activities	5
Slight difficulty	4	Every step	0
Straight ahead only	2		
Unable	0	<i>B. Pain</i>	
<i>Jumping:</i>		None	30
No difficulty	5	Inconstant and slight during severe exertion	25
Slight difficulty	3	Marked on giving way	20
Unable	0	Marked during severe exertion	15
Pain (30 points)		Marked on or after walking more than 2 km	10
None	30	Marked on or after walking less than 2 km	5
Not incapacitating	25	Constant and severe	0
Incapacitating	10		
Severe	0	<i>C. Swelling</i>	
Anatomy (5 points)		None	10
<i>Swelling (3 points)</i>		With giving way	7
None	3	On severe exertion	5
Slight and occasional	1	On ordinary exertion	2
Frequent	0	Constant	0
<i>Atrophy of thigh (2 points)</i>		Atrophy of thigh (5 points)	
None	2	None	5
1-2 cm	1	1-2 cm	3
More than 2 cm	0	More than 2 cm	0
Range of motion (10 points)			
0-45°, deduct for each			
10° loss	1		
45-90°, deduct for each			
15° loss	1		
90-100°, deduct for each			
20° loss below			
130°	1		

opinions of the patients reviewed after treatment of acute knee injuries. They were asked to assess the function of the injured joint as follows: Excellent (very slight or no difference when compared to the normal knee); good (slight but no incapacitating difference in function when compared to the

other knee); fair (significant but "acceptable" impairment of function); or poor (intolerable impairment of function).

The total score on our scale for patients with objective instability was compared with the scores for patients with minimal or no instability so we could see if our scale corre-

lated with instability. All patients were examined by the same surgeon. The results were treated statistically by standard methods.²² Values given in the text are mean \pm standard deviation.

RESULTS

Differences between scales

A significantly lower mean total score was found in our scale in patients with anteromedial rotatory instability (AMRI) and/or anterolateral rotatory instability (ALRI); ($P < 0.001$). The three other groups showed no difference between mean total scores with the two scales (Fig. 1).

When individual items in our scoring scale were analyzed, significantly lower ratings were found in the item "instability" between patients with AMRI/ALRI vs. patients with chondromalacia patellae or meniscus lesion ($P < 0.01$; $P < 0.05$) and between patients with straight posterior instability (SPI) vs. patients with chondromalacia patellae ($P < 0.05$; Table 2). In our scale, the mean score on the item "pain" for chondromalacia patellae (9.5 ± 6.25) was significantly lower than that for AMRI/ALRI (16.7 ± 0.8 ; $P < 0.05$). SPI also had a lower pain score (10.0 ± 10.9) than AMRI/ALRI, although the difference was not statistically significant.

One hundred and thirty patients reviewed 1-8 years after treatment for acute knee injury were asked to define their knee function as excellent, good, fair, or poor. Their classification was found to correlate to the total score on our scale (Fig. 2). The good and fair groups had a significantly lower score than patients with an excellent result ($P < 0.01$).

Seventeen percent (22/130) of the patients still had instability at clinical examination (abduction stress test, anterior or posterior drawer sign 2+ or more; pivot shift 1+ or more, separately or in combination). Their score 75.6 ± 17.8 with our scale was significantly lower than that for patients with

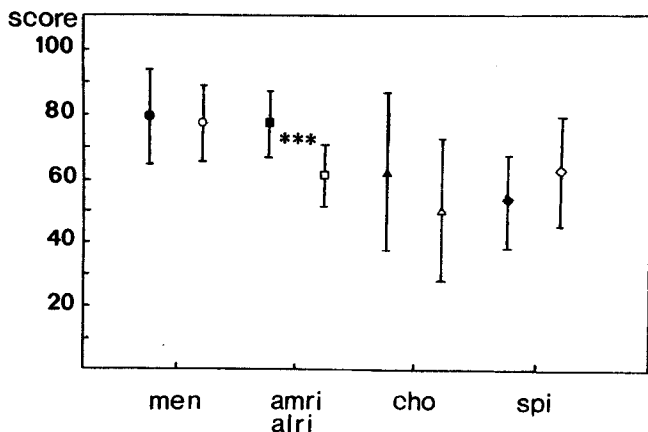


Figure 1. Mean scores and standard deviations with the modified Larson scoring scale (solid symbols) and our scoring scale (open symbols) in patients with meniscus lesion (men, 11 patients), anteromedial and/or anterolateral instability (amri/alri), 21 patients, chondromalacia patellae (cho, 11 patients), and straight posterior instability (spi, 8 patients). ***Indicates statistical difference ($P < 0.001$).

TABLE 2
Distribution of instability scores

Score	Anteromedial and/or anterolateral instability	Straight posterior instability	Chondromalacia patella	Meniscus lesion
0		1		
5	2	3		
10	11	1	2	
15				
20	7	1		3
25	1	1		1
30		1	9	7
Total no. patients	21	8	11	11

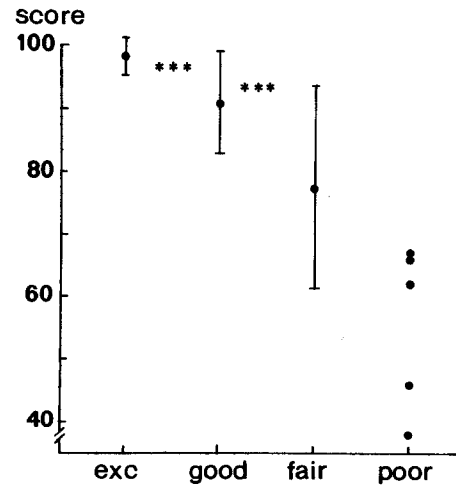


Figure 2. Mean total scores and standard deviation for patients in group excellent ($n = 62$), good ($n = 43$), fair ($n = 20$), and poor ($n = 5$), using our scoring scale. ***Indicates statistical difference ($P < 0.001$).

minimal (less than above) or no objective instability after treatment (mean 93.6 ± 10.8 ; $P < 0.001$. Fig. 3).

Sixteen patients with ligament injury, meniscus lesion, or chondromalacia patellae were evaluated twice with our scoring scale with an interval of 3 days by two examiners. The coefficient of variation between the two measurements was 2.8% (Fig. 4).

DISCUSSION

The need for reproducible methods of evaluating the results of knee ligament surgery has been a challenge to many authors. Efforts to solve the problem have been made in the biomechanical and roentgenographic fields. Measurements of ligament laxity²³⁻²⁷ involve problems with uncontrolled leg rotation (W. G. Clancy, personal communication, 1979).²⁸ Deeper understanding of the complicated biomechanics of the knee and the discovery of rotatory instabilities²⁹⁻³¹ have drawn attention to the difficulties of measuring simultaneous rotation, sliding, and rocking in the joint by a simple method. Knee-scoring scales provide an entirely different approach to the problem. A questionnaire is set up to establish the

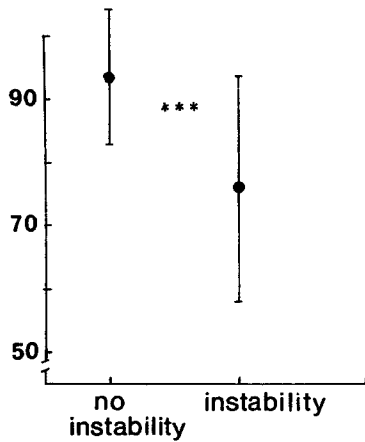


Figure 3. Mean scores and standard deviations using our scoring scale in patients with no or minimal objective instability and in patients with instability at follow-up after treatment for acute knee ligament injury. *** Indicates statistical difference ($P < 0.001$).

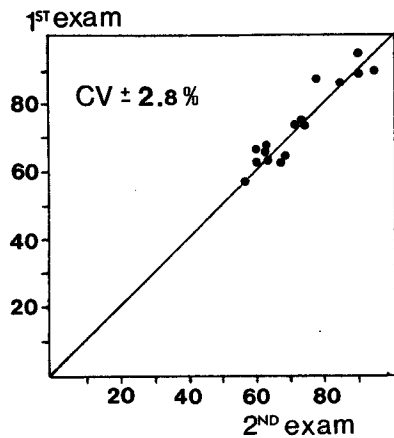


Figure 4. Reproducibility of our scoring scale as a correlation between 1st and 2nd evaluation in the same 16 patients 3 days later. CV = coefficient of variation.

patient's knee function in everyday situations. The questionnaire must consider activities in daily life that are important to the patient, and the score must be adapted to the level of function in the patients for whom it is intended. A knee-scoring scale for evaluating knee ligament surgery must be designed for a group of patients mainly consisting of young, vigorously active people. One important goal in rehabilitation is reentry into competitive and weekend athletics. Therefore, return to athletics has been used as a measure of knee surgery.⁶⁻⁸ There is correlation between the feeling of instability and failure to take up athletics again.³² Palmer¹⁹ stated that symptoms of instability may be disguised or hidden by a change of life-style which the patient undergoes for no apparent reason. Thus there is a need to introduce the item "instability" into a scoring scale intended for knee ligament injuries which also has been pointed out by Marshall et al.¹⁷ When defining instability, we chose the symptom "giving way" because this is correlated with lack of

ligament stability, especially anterior cruciate ligament insufficiency.^{5, 19, 20} The introduction of the item "instability" into our scoring scale was the main reason for the difference we found when we compared our scale with the modified Larson scale. Therefore, the only group with a significant difference between the two scales was the AMRI/ALRI groups. The other groups showed no significant differences because, except for "instability," the two scales measure basically the same thing. Although item-analysis showed that instability is an important symptom in both AMRI/ALRI and SPI, some patients with SPI mainly have pain. Their feeling of instability is diffuse, unlike the typical "giving way" that is seen in ALRI. Their general knee function is bad (e.g., stair-climbing, squatting), and their pain score low, resulting in low total scores on our and Larson's scales. Pain is also important in patients with chondromalacia patellae. These differences between different knee disorders, besides factors such as age and activity level, suggest a need for different or modified scoring scales for the follow-up of patients with different diagnoses.

Our scoring scale deals mainly with the patients' own evaluation of function, and objective signs—e.g., ligament instability and range of motion—should be noted separately. The only clinical sign retained is quadriceps muscle atrophy, because it is closely correlated to the overall function of the joint.³³

The scale must also be suitably arranged for computer analysis.¹⁶ Furthermore, the total score should correspond to objective signs of internal derangement—in this case, signs of instability. We have found a correlation between the total score on our scale and the patient's own opinion of function. We also found a correlation between signs of instability on examination and a low total score. The reproducibility of our scoring scale was good.

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