Subjective Grade of Apprehension during the Pivot Shift Test Reflects Patient-reported Outcomes more than Conventional Pivot Shift Test Grade after Anterior Cruciate Ligament Reconstruction

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Background

Pivot shift test

0 (equal)
1+ (glide)
2+ (clunk)
3+ (gross)

IKDC grading (Grade 0 – 3)

The **pivot-shift test** is a better measure of clinical outcomes than instrumented anterior knee laxity or Lachman examination after ACL reconstruction.

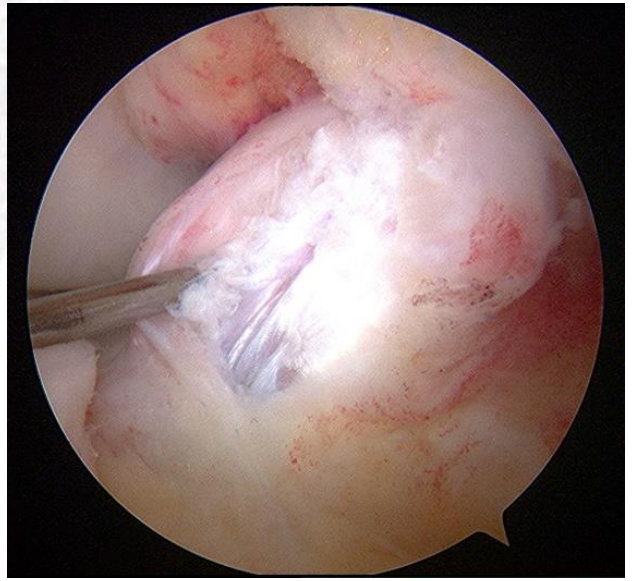
The pivot shift test grade, in contrast to anterior stability test grades, has significant associations with certain subjective symptoms and functions after ACL reconstruction.

Kocher MS, et al. ***Am J Sports Med 2004***

Ayeni OR, et al. ***Knee Surg Sports Traumatol Arthrosc 2012***

Purpose

The purpose of this study was to identify factors that affect inferior patient-reported outcome after ACL reconstruction.



Methods

Multicenter prospective cohort studies of ACL injury

Hiroshima Clinical ACL Research Project
Hiroshima CARP

665 patients: (Male; 339, Female; 326) (Age; 28.5 y.o.)

- ✓ Primary ACL reconstruction using hamstring tendon
- ✓ One year follow-up after ACL reconstruction

Knee injury and Osteoarthritis Outcome Score (KOOS) patient-reported outcomes

Tegner activity scale after ACL reconstruction

Results

Single regression analysis

Anterior knee stability

Post. op	correlation coefficient (r)	*p*-value
KOOS Symptom	0.046	0.24
KOOS Pain	0.058	0.14
KOOS ADL	0.037	0.34
KOOS Sports	0.035	0.85
KOOS QOL	0.051	0.19
Tegner activity scale after ACL reconstruction	0.052	0.20

Anterior knee stability **did not** have significant associations with any KOOS subscales and Tegner activity scale after ACL reconstruction

Results

Pivot shift test

IKDC grading

Post op.	Post op. Pivot shift Negative	Post op. Pivot shift Positive	*p*-value
KOOS Symptom (points)	88.5 ± 13.6	88.3 ± 12.7	0.89
KOOS Pain (points)	92.6 ± 10.7	94.8 ± 6.4	0.18
KOOS ADL (points)	97.6 ± 7.0	98.4 ± 4.0	0.33
KOOS Sports (points)	86.1 ± 17.2	85.7 ± 15.8	0.85
KOOS QOL (points)	80.1 ± 19.4	80.4 ± 17.0	0.88
Tegner activity scale after ACL reconstruction	5.6 ± 1.8	5.5 ± 1.8	0.41

The pivot shift test grade **did not** have significant associations with any KOOS subscales and Tegner activity scale after ACL reconstruction.

Pivot shift test

Apprehension grading

(Grade 0 – 3)

0 (no apprehension)
1+ (mild apprehension)
2+ (moderate apprehension)
3+ (severe apprehension)

Nakamae A, Adachi N, et al. *Knee Surg Sports Traumatol Arthrosc 2022*

In this study

Grade 0; negative, Grade 1–3; positive

Results

Pivot shift test

Apprehension grading

Post op.	Post op. Pivot shift Negative	Post op. Pivot shift Positive	*p*-value
KOOS Symptom (points)	88.6 ± 13.9	85.4 ± 15.0	**0.045**
KOOS Pain (points)	92.9 ± 10.8	91.9 ± 9.6	0.42
KOOS ADL (points)	97.6 ± 7.1	97.3 ± 6.0	0.64
KOOS Sports (points)	87.0 ± 16.6	80.6 ± 18.4	**0.045**
KOOS QOL (points)	81.1 ± 18.7	74.4 ± 20.3	**0.010**
Tegner activity scale after ACL reconstruction	5.7 ± 1.8	5.2 ± 1.8	**0.027**

Apprehension grading of the pivot shift test has significant associations with 3 KOOS subscales and Tegner activity scale after ACL reconstruction

Multivariable regression analysis

to identify factors that affect inferior KOOS after ACL reconstruction

24 Variables

Age at ACL reconstruction

Sex

Tegner activity score before injury

BMI at ACL reconstruction

Range of motion (knee extension and flexion)

Valgus and Varus knee instability

Time from injury to ACL reconstruction

Osteoarthritis (K-L classification)

Conditions of the articular cartilage (LFC, LTP, MFC, MTP, Patella, Groove)

Side-to-side difference of anterior knee laxity before ACL reconstruction

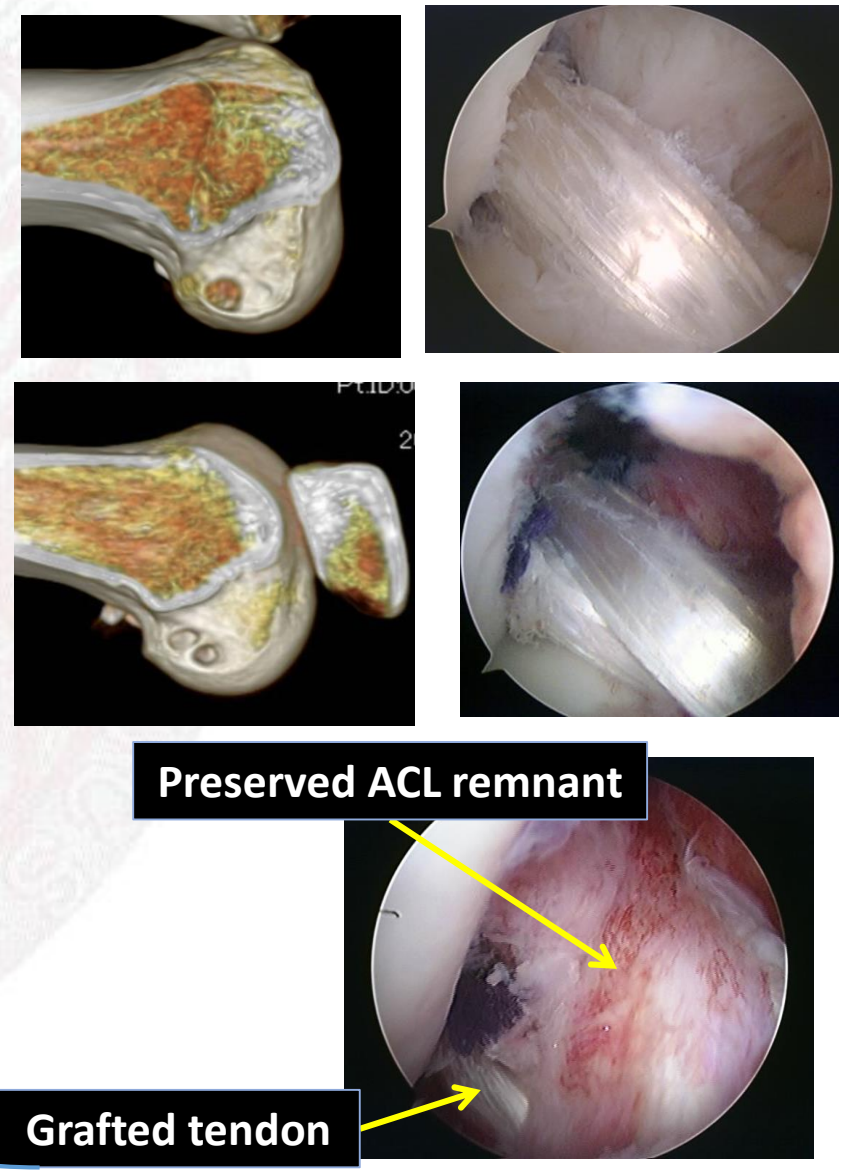
FTA

Pivot-shift test (IKDC grading and Apprehension grading)

Surgical techniques (Single, Double, Augmentation, Other)

Medial meniscus treatment (None, Partial meniscectomy, repair)

Lateral meniscus conditions (None, Partial meniscectomy, repair)



Results

Factors affecting low KOOS sub-scores

Older age

5 sub-scores

Symptom **Pain** **ADL** **QOL** **Sports**

Older age at ACL reconstruction was a significant factor that affect inferior KOOS in all of the five subscales.

Results

Factors affecting low KOOS sub-scores

Older age — **5 sub-scores**

Symptom Pain ADL QOL Sports

Knee extension disturbance — **4 sub-scores**

Symptom Pain QOL Sports

Extension disturbance of the knee at 1 year after the surgery significantly affected poor PRO in four of 5 KOOS subscales.

Results

Factors affecting low KOOS sub-scores

Older age — **5 sub-scores**

Symptom Pain ADL QOL Sports

Knee extension disturbance — **4 sub-scores**

Symptom Pain QOL Sports

Greater pivot shift apprehension grade — **3 sub-scores**

Symptom QOL Sports

Higher grade of the apprehension during the pivot shift test at 1 year after the surgery significantly influenced poor patient-reported outcomes in three KOOS subscales (symptoms, QOL, and sports).

Conclusions

Apprehension grading of the pivot shift test has significant associations with certain subjective symptoms and functions after ACL reconstruction