Clinical Decision Making in Partial ACL-Tears

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The anterior cruciate ligament (ACL) is composed of two bundles:
- antero-medial (AM) bundle
- postero-lateral (PL) bundle

- The AM bundle is taut in higher flexion angles, and the PL bundle is taut near full extension\(^1\)
- Each bundle is exposed to different tension pattern → isolated bundle tear is feasible
Introduction

- Magnetic Resonance Imaging (MRI) can give a hint, but has been shown to be not always accurate when diagnosing partial ACL ruptures
Introduction

• Pre-operative examination is of high importance to diagnose the correct injury pattern and to evaluate the function of the remaining part of the ligament.

• The surgeon has to consider if an isolated reconstruction of one bundle can achieve sufficient stability

_Literature:_
• Isolated reconstruction of a single ACL bundle in a partial rupture can restore knee stability and function\(^2\)
• Significantly better synovial coverage of the graft in patients who received augmentation surgery of one bundle compared to conventional single- and double bundle reconstruction\(^3\)
• Proprioception, joint stability, and balance ability have been shown to be superior with single-bundle augmentation compared to conventional single-bundle reconstruction\(^4\)
Aim

• to examine the diagnostic values of the commonly used knee function tests on patients in detecting partial injury patterns of the ACL

• to assess if using multiple tests collectively for the diagnosis of the injury could improve diagnostic accuracy
Methods

• Examination under anesthesia (pre-OP in the operation room)
  • Lachman Test incl. Endpoint (firm/soft)
  • Anterior Drawer
  • Pivot Shift Test

• Rupture pattern confirmed by arthroscopy

• 36 consecutive patients with a partial rupture of the ACL
  • Isolated tear of the AM bundle: 9
  • Isolated tear of the PL bundle: 27

• matched by gender and age to 36 patients with complete rupture
• Diagnostic value for each knee function test:
  • Sensitivity
  • Specificity
  • Positive Likelihood Ratio
  • Negative Likelihood Ratio

• Prediction of specific ACL injury pattern for each individual test and the tests collectively were investigated by using binary and multinomial logistic regression
  • Significance was set at $p<0.05$
Results

(Complete-Partial, Complete-PL, Complete-AM, AM-PL)

- **High Sensitivity:**
  1. Endpoint Lachman Test   \( (1; 1; 1; 0.89) \)
  2. Lachman Test               \( (0.81; 0.89; 0.78; 0.56) \)

- **High Specificity:**
  1. Pivot Shift Test          \( (0.81; 0.78; 0.81; 0.81) \)
  2. Anterior Drawer           \( (0.78; 0.56; 0.85; 0.85) \)

- **Highest Positive Likelihood-Ratio:**
  1. Pivot Shift-Test          \((\text{Complete-PL}: 2.8; \text{KI 95\% (1.17; 6.69)})\)

- **Smallest Negative Likelihood-Ratio:**
  1. Lachman Test               \((\text{Complete-Partial}: 0.39; \text{KI 95\% (0.19; 0.82)})\)
Results

- **complete rupture vs. partial rupture:**
  Combination Pivot Shift Test + Lachman Test
  Odds-Ratio: + 200%

- **isolated PL-tear vs. complete rupture:**
  Pivot Shift Test
  Odds-Ratio 0.20; KI 95% (0.06; 0.66); p < 0.05

- Anterior drawer more likely positive in AM-tear than in PL-tear and in complete rupture than in partial tear (n. s.)
Collectively using both Lachman test and pivot shift test increases ability to distinguish between partial ruptures and complete ruptures.

When comparing PL tears and complete ruptures the pivot shift test is more important than the Lachman test.

In diagnosing AM tears among patients with partial ruptures and in diagnosing a complete rupture, the evaluation of the endpoint is more sensitive than the Lachman test.
Algorithm

based on the results of this study
Case Presentation: Isolated PL-Bundle-Reconstruction

References:


