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Behaviour of Anterior Cruciate Ligament (ACL) Deficient Knees After Unicompartmental Knee Arthroplasty (UKA)

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Abstract:
Introduction:
ACL-deficiency is a contraindication for UKA because it has been linked with early failure, in particular tibial tray loosening [1]; but a more recent study has shown no difference in the survivorship in ACL-deficient patients at 5 years post-operatively [2]. The purpose of this study was to examine the movement of ACL-deficient knees after UKA when stair climbing, to assess the function of ACL-deficient knees after UKA.
Methods:
This case-control study involved fluoroscopically examining 16 ACL-deficient knees (14 patients) which had undergone medial UKA. Fluoroscopy videos were taken in the sagittal plane. A matching group of 16 ACL-intact knees (13 patients) were then assessed; groups were matched for age, follow-up time, and gender, and no significant differences were found between the groups (Table 1).
Starting with their leg on the step at a knee flexion angle (KFA) of 90°, patients were asked to step up, while ensuring their knee remained within the view of the fluoroscope. The patellar tendon angle (PTA) and KFA was measured on each frame of each fluoroscopic video, and the total time taken to perform the exercise was noted. The PTA is the angle between the patellar tendon and the tibial mechanical axis and it represents the anterior-posterior translation of the femur relative to the tibia.
In addition, patients were asked to complete three questionnaires; the Oxford Knee Score (OKS), the Tegner Activity Score (TAS) and the Visual Analogue Scale (VAS) Pain Score.
Results:
No differences were found in the OKS (p=0.35), TAS (p=0.15) or VAS Pain score (p=0.73) between the two groups. When the KFA was ~30° the PTA was 5° lower in the ACL-deficient group compared with the ACL-intact group (p=0.0002, Fig 1). A 2.9° reduction in PTA was also observed at a KFA of 60° (p=0.007, Fig 1). The

ACL-deficient group took 30.7% (13 s) longer to perform the step-up exercise on average compared to the ACL-intact group, which was significant (p=0.0007).

Discussion and Conclusion:

The lower PTA in the ACL-deficient knees at 30°, 40° and 60° KFA indicates increased anterior translation of the tibia. A healthy ACL resists anterior tibial translation; therefore the absence of ACL function appears to have caused knee instability at these particular angles. In addition, the increased time taken for the ACL-deficient group to step up indicates hesitancy when stair climbing and may relate to the reduced proprioception within the knee. This study highlights the importance of ACL function in maintaining knee stability after UKA. Knee instability may relate to the tibial loosening reported for ACL-deficient knees after UKA; however, no sign of loosening was observed in this study. ACL reconstruction in conjunction with UKA has been shown to restore stability and may be the best option for ACL-deficient patients with medial compartment osteoarthritis.

References:

[1] J Goodfellow et al., J Bone Joint Surg [Br]. 1988; 70-B(5):692-701

[2] A Boissonneault et al., Knee Surg Sport Tr A. 2013;21(11):2480-6

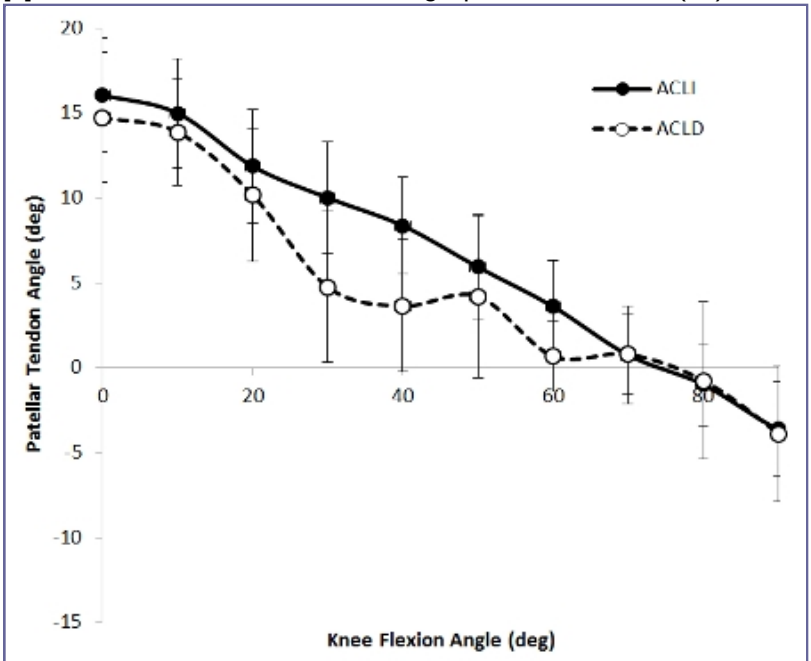

Figure 1. Patellar tendon angle at different knee flexion angles during a step-up exercise for ACL-intact (ACLI) and ACL-deficient (ACLD) patients.

Table 1. Age, time to follow-up and gender of the ACL-deficient and ACL-intact groups

	ACL-deficient	ACL-intact	Significance
Mean Age [years(range)]	67.0 (50-87)	68.3 (49-86)	0.81
Mean Follow-up Time [years(range)]	6.3 (1.3-12.8)	6.0 (2.6-11.0)	0.82
Gender [% male]	85.7	92.3	0.32

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Category (Complete): Unicompartmental Arthroplasty (Knee)

Keyword (Complete): ACL Deficient ; Unicompartment Arthroplasty ; Anatomy / Biomechanics
Research Type & Summary (Complete):
***Research Type:** Clinical Science
***Summary Sentence:** : If medial UKA is performed in an ACL-deficient knee, some anterior-posterior knee instability is likely to occur during stair climbing and patients will take 31 % longer on average to climb stairs.

Additional Information (Complete):
*Has this information been presented or published at the national level?: No

*Are your research subjects living humans or animals?: Yes

*Were any patient records or imaging studies reviewed for this study?: Yes

*Does this research use only biomechanical testing, data from published articles, databases or specimens that are publicly available?: No

*Number of subjects : 27

*Type of investigation: Prospective

*Randomization: Non-randomized

*Control Group: Yes
*FDA Status: The FDA has approved all devices and pharmaceuticals for the use described in this study
*Was this research approved by an Instituional Review Board (IRB) or ethics committee?
: YES, Approved
*Permission is given to the American Academy of Orthopaedic Surgeons to cover the Paper/Poster Presentation in AAOS Now.: Yes
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