Objectively measuring knee extension is critical when analyzing long term outcomes after an anterior cruciate ligament reconstruction

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INTRODUCTION: Structural abnormalities, such as meniscus tears and chondral injuries, seen at the time of an anterior cruciate ligament (ACL) reconstruction, as well as abnormal objective measures, like knee extension stiffness, can lead to unfavorable short term outcomes following surgery.[1–4,6–8,10] Furthermore, a lack of full knee extension in the short term has been shown to lead to a lack of full knee extension in the long term.[7] However, long term outcomes based on knee extension are unknown as they are typically judged with subjective data only or are based on whether or not the patient had meniscus tears or chondral injuries seen at the time of surgery, without factoring in objective measures.[5,9] The purpose of this study was to determine long term functional outcome differences after an ACL reconstruction, for those with varying structural abnormalities, based on normal and abnormal knee extension.

METHODS: Between 1982 and 2011, 3382 patients having an ACL reconstruction using a patellar tendon graft were enrolled into the study. Exclusion criteria included revisions, bilateral involvement, and osteoarthritis (OA) at the time of surgery. Patients were split into four groups based on structural abnormalities, normal (group 1), meniscus tear (group 2), chondral injury (group 3), and a combination of meniscus tear and chondral injury (group 4). Patients followed up for data collection and radiographs at a minimum 10 years postoperative. Abnormal knee extension was defined as more than 2° off compared to the involved knee. The International Knee Documentation Committee (IKDC) was collected and radiographs were graded based on the medial and lateral compartment. Additionally, short term knee extension at 2 months postoperative was compared to long term knee extension.

RESULTS:

Of the 3382 patients, 883 (26%) had subjective, objective, and radiographic data at a mean 17.7 ± 6.2 years (range, 10-39) while another 879 (26%) had subjective data only at a mean 20.2 ± 7.4 years (range, 10-39). Patients with abnormal knee extension at 2 months postoperative were 6.4 times more likely to have abnormal knee extension at long term follow up (p<.001). At long term follow up, 83% of patients had normal knee extension. The rate of moderate to severe knee OA for groups 1-4 was 5%, 12%, 16%, and 25%, respectively (p<.05). The rate of moderate to severe OA and IKDC scores, when spilt based on knee extension, can be seen in table 1. Overall, patients with abnormal knee extension were 5 times more likely to have OA compared to those with normal extension. Patients with a meniscus tear were 2.4 times more likely to have OA and those with chondral injuries were 2.7 times more likely when compared to those without a structural abnormality, p<.05.

DISCUSSION AND CONCLUSION: Abnormal knee extension early after surgery can negatively affect knee extension long term as those that are lacking motion early rarely have normal extension long term. Abnormal knee extension long term can lead to lower subjective scores and higher rates of OA when compared to those with normal extension. A loss of knee extension long term results in more negative outcomes than meniscus tears or chondral injuries. Objectively measuring extension long term after surgery can help explain positive and negative outcomes for patients after surgery, based on structural abnormalities.

Table 1: Rates of moderate to severe OA and IKDC scores based on ROM and meniscus/chondral status

	Group 1: Normal knee (n=127)		*Group 2: Meniscus tear (n=382)*		*Group 3: Chondral injury (n=56)*		*Group 4: Meniscus tear and chondral injury (n=318)*	
Extension	Normal (n=116)	Abnormal (n=11)	Normal (n=326)	Abnormal (n=56)	Normal (n=51)	Abnormal (n=5)	Normal (n=237)	Abnormal (n=81)
Rate of OA	3%*	27%*	9%*	29%*	12%*	60%*	18%*	46%*
IKDC scores	87*	72*	87*	73*	88*	75*	85*	76*

Note: *Statistically significant, p<.05