ISAKOS CONGRESS 2023
Boston Massachusetts June 18 – June 21
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International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine

Respective roles of the ACL and the medial structures on the control of anterior translation and rotations of the knee

Cadaveric study of 29 knees with the Dyneelax®

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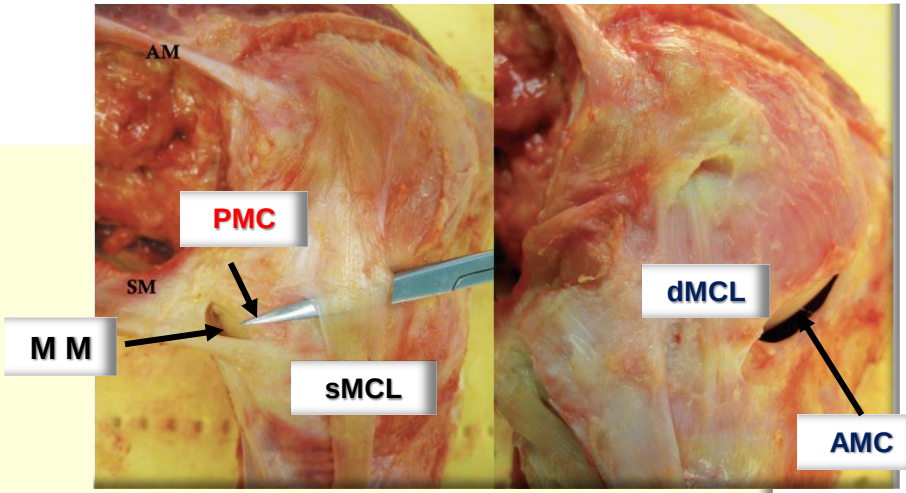
Disclosure:
no conflict of interest

Introduction



Structures of the medial plane

(Woo S, 1999, Robinson J, 2004, Cinque ME, 2017)

- *Anteromedial capsule (AMC)*
- *Medial Collateral Ligament (MCL)*
- *Postero medial capsule (PMC)*
- *Capsular medial meniscal junction (MM)*

Medial structures lesions are frequently associated with an ACL rupture

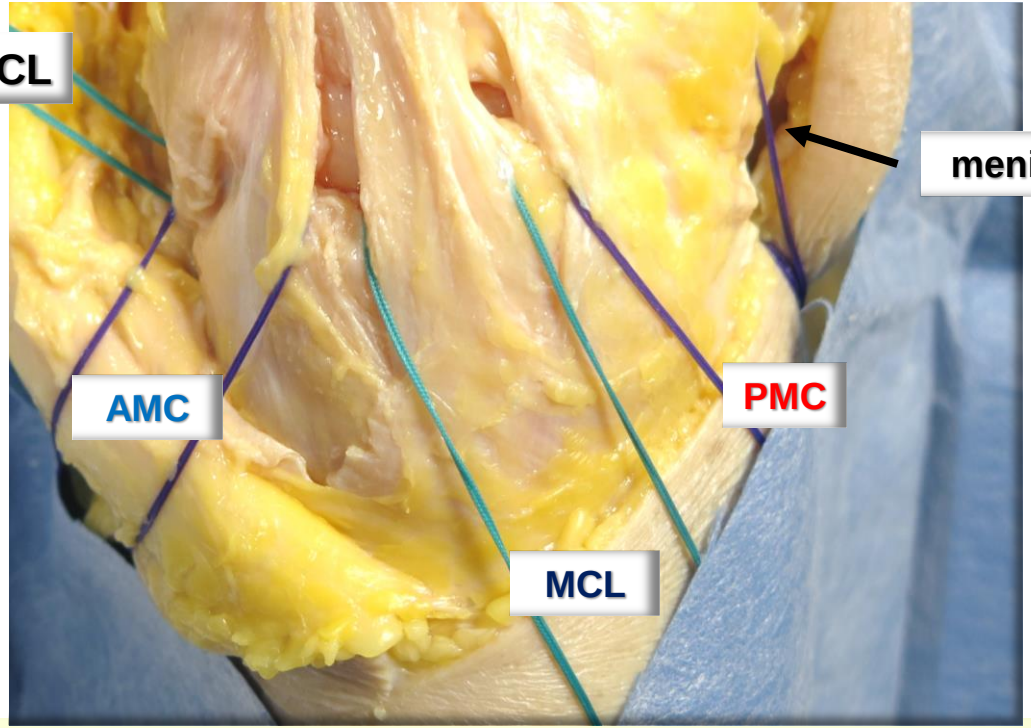
(67% of MRI, Willinger L, 2022)

- *Risk of re-rupture of isolated ACL reconstruction*
- *Risk of residual laxity*
- *Risk of residual pain*

Objective: ***determine the respective roles of the ACL and the different components of the medial plane in controlling anterior translation and medial and external rotation***

Method

Medial view of a right knee



* 29 lower limbs were disarticulated at the hip and submitted to the protocol

* Each structure: ACL, AMC, sMCL, dMCL, PMC and the posterior segment of the MM, were cut sequentially

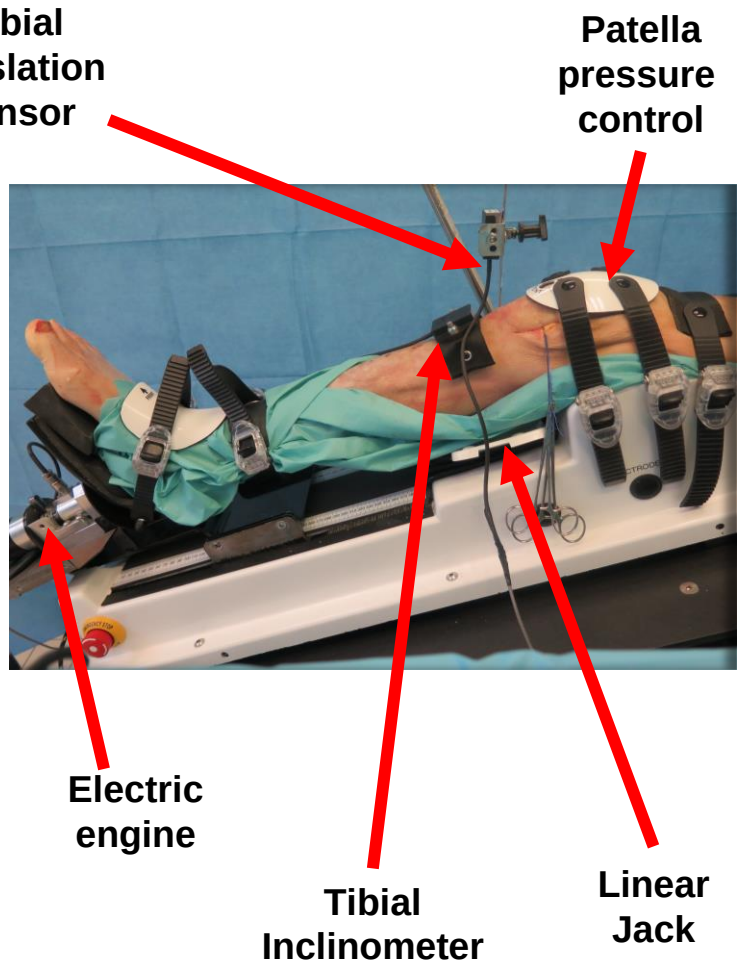
Material

* Dyneelax®laximeter (*precisions of 0.1 mm and 0.1°) at* 30° of flexion, forces up to 200 N and torques up to 5 N/m in internal and external rotations

* The healthy knee is tested and the displacements after the sectioning of each structure are recorded

* Translations (mm) and rotations (°) are recorded (absolute values) and the gain is calculated in relation to the healthy knee (relative values)

* Holm-Sidak multiple comparison test ($p<0.05$)

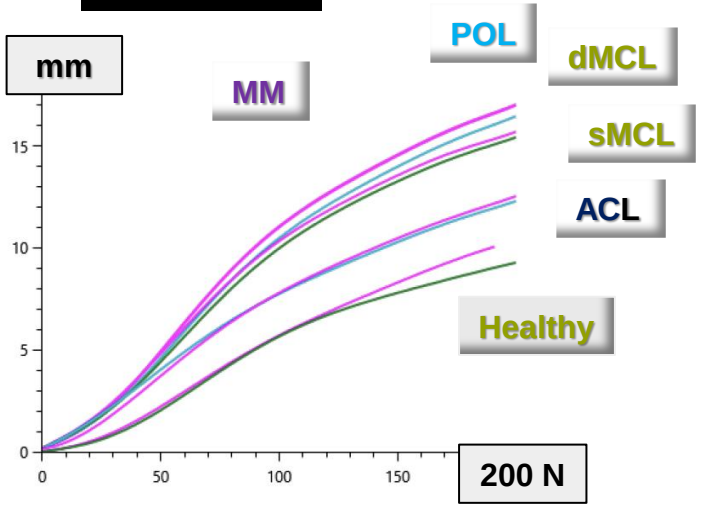


Results

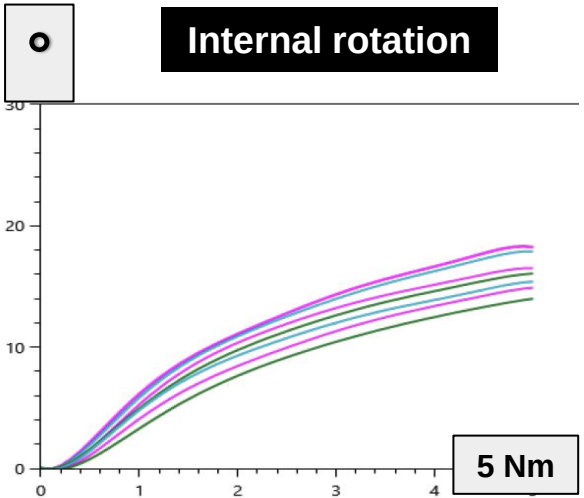
Case 20
Man, 80 years

Absolute values curves in translation (mm)
or rotation (°) according to the forces and torques

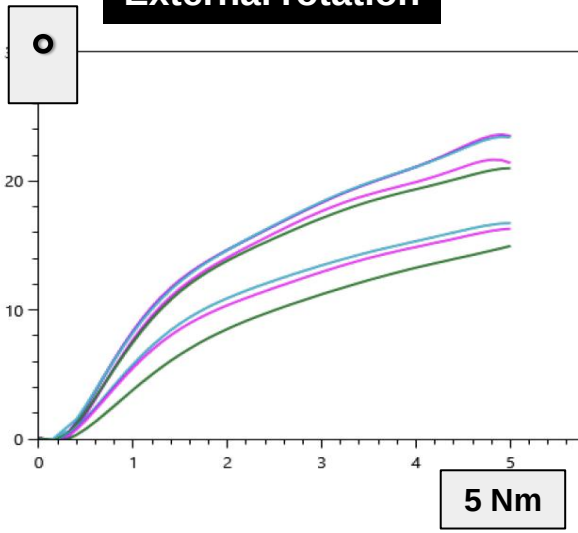
Translation



Internal rotation



External rotation



Results in absolute values

	Translation (mm)	I R (°)	E R (°)
ACL	2.95	1.35	1
AMC	0.55	0.74	0.8
sMCL	0.56	0.55	1.38
dMCL	0.52	0.46	1.78
POL	0.51	1.45	1.29
Medial meniscus	0.89	0.7	0.83

Results in relative values (%)

	Translation (%)	I R (%)	E R (%)
ACL	37.5	10.8	7.8
AMC	6.9	6.3	6.4
sMCL	6.3	4.2	9.2
dMCL	7.1	3.7	13.2
POL	7	13.9	11.1
Medial meniscus	11.6	8	8.5

Discussion

Our significant results ($p < 0.05$) :

- **ACL:** *control of translation and rotations (I and E)*
- **AMC:** *control of external rotation*
- **sMCL:** *control of external rotation*
- **dMCL:** *control of external rotation*
- **POL:** *control of rotations (I and E)*
- **Meniscus**: *control of translation and internal rotation*

References (at 30° of flexion) :

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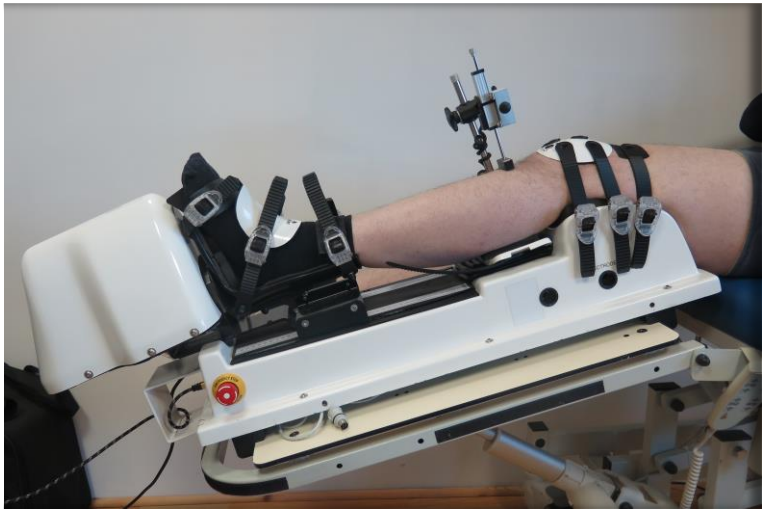
- **ACL:** *control of translation and internal rotation*
- **AMC:** *not studied*
- **sMCL**: *control of rotations (I et E) and valgus*
- **dMCL:** *control of rotation (I and E) and valgus*
- **POL:** *control of internal rotation*
- **LR:** *control of rotations (I et E)*

Discussion

Strengths	Limitations
Disarticulation and conservation of all soft tissue	Tests only at 30° of flexion
Number of cadavers (29)	Average age (82 years)
Tests on all the structures of the medial plane	Meniscal lesions on 16 knees
Precision of the Dyneelax®	No frontal testing (Valgus)

Conclusion



All structures of the medial plane are involved in sagittal and rotational control

Precise clinical testing can help to identify the injured ligament structure

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