Medial laxity, poster-medial laxity and AMRI

In ACL deficient knee

Drs Nicolas GRAVELEAU, Nicolas BOUGUENNEC, Etienne CAVAIGNAC and SFA surgeons

SFA - FRANCE

HELLO TO PETER VERDONCK

He was yesterday in the OR … but not on the good side of the drape !!!

MEDIAL STRUCTURES LESIONS ASSOCIATED WITH ACL TEARS

- MCL + ACL = 2 **most frequently injuried** ligaments of the knee

  But few cases require surgery

  Associated with the Antero-Medial Rotatory Instability (AMRI)

- Consensus for some points… **but not for all**
- Analysis is difficult because a lot of :

  lesions described with variable definitions

  surgical techniques

- **Actuality** topic !

Willinger et al. KSSTA 2021
Ball et al. KSSTA 2020
Zhang et al. AJSM 2014
Engebretsen & Lind KSSTA 2015
Miyasaka et al. AJKS 1991

Treatment of Combined Injuries to the ACL and the MCL Complex

A Consensus Statement of the Ligament Injury Committee of the German Knee Society (DKG)

Daniel Guenther,* MD

Investigation performed at Cologne Merheim Medical Center, University Witten/Herdecke, Cologne, Germany

The Orthopaedic Journal of Sports Medicine, 9(11), 2325967121105092 9
DOI: 10.1177/2325967121105092 9
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Knee Surgery, Sports Traumatology, Arthroscopy
https://doi.org/10.1007/s00167-020-06336-3

KNEE

The posteromedial corner of the knee: an international expert consensus statement on diagnosis, classification, treatment, and rehabilitation

Jorge Chahla[1] · Kyle N. Kunze[2] · Robert F. LaPrade[3] · Alan Getgood[4] · Moises Cohen[5] · Pablo Gelber[6,7] · Björn Barenius[8] · Nicolas Pujol[9,10] · Manual Leyes[11] · Ralph Akoto[12] · Brett Fritsch[13] · Fabrizio Margheritini[14] · Leho Rips[15] · Jakub Kautzner[16] · Victoria Duthon[17] · Danilo Togninalli[18] · Zanon Giacamo[19] · Nicolas Graveleau[20] · Stefano Zaffagnini[21] · Lars Engbretsen[22] · Martin Lind[23] · Rodrigo Maestu[24] · Richard Von Bormann[25] · Charles Brown[26] · Silvio Villascusa[27] · Juan Carlos Monllau[28] · Gonzalo Ferrer[29] · Jacques Menetrey[17] · Michael Hantes[30] · David Parker[13] · Timothy Lording[31] · Kristian Samuelsson[32,33] · Andreas Weiler[34] · Soshi Uchida[35] · Karl Heinz Frosch[36,37] · James Robinson[26,38]

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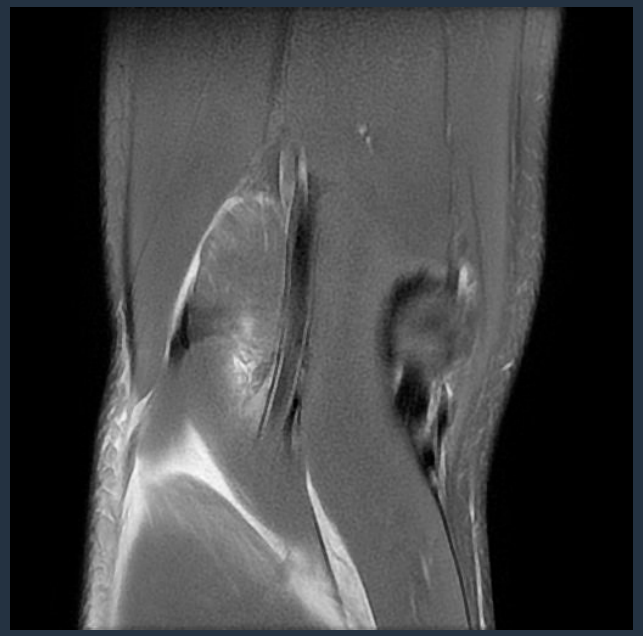
WHY SUCH A TOPIC ?

- MCL injuries → healing is the rule with conservative treatment

But… sometimes, no healing

Indelicato et al. JBJS Am 1983
Petermann et al. KSSTA 1993



↓

Medial Laxity & Instability

Zhu et al. KSSTA 2018
Zhang et al. AJSM 2014

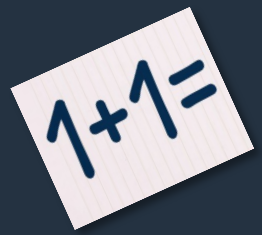
↓

Failure of the ACL

Svantesson et al. KSSTA 2019

↓

So what to do with the MCL when ACL rupture ?



Combined ACL & MEDIAL structures of the knee

Symposium SFA 2023

N. BOUGUENNEC, T. NERI, C. HERCE, C. LUTZ, B. FREYCHET, C. KAJETANEK, A. HARDY, M. OLLIVIER, E. CAVAIGNAC

SFA 2023
Société Francophone d'Arthroscopie
LYON
CENTRE DES CONGRÈS
14.15.16 DÉCEMBRE

CENTER INVOLVED IN THIS SFA STUDY

Sympo LCA LCM

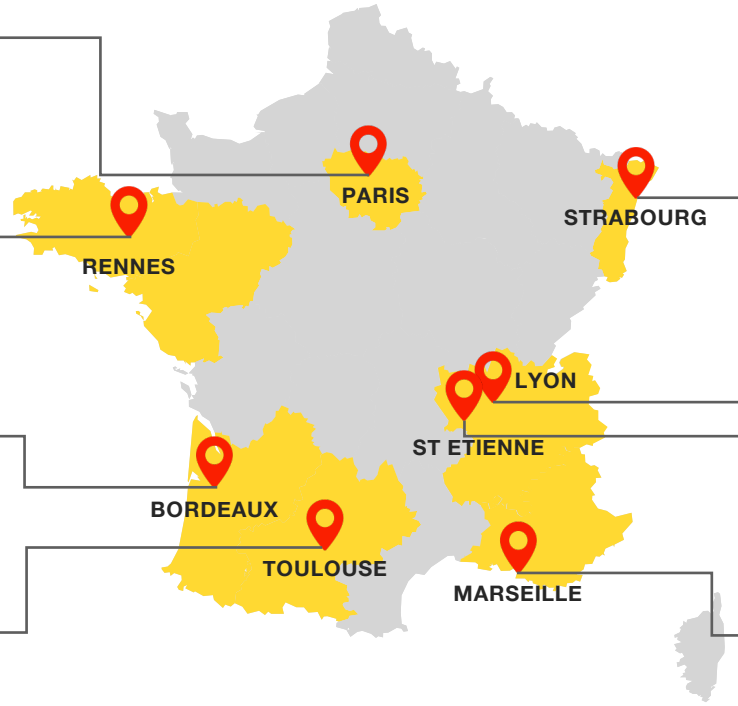
Ramsay Santé Clinique du Sport

VIVALTO SANTÉ Les Hôpitaux Privés Rennais Saint-Grégoire

CLINIQUE DU SPORT BORDEAUX - MERIGNAC

CHU de Toulouse

Médi POLE Garonne Clinique du sport Médico-Chirurgicale



Rhëna CLINIQUE DE STRASBOURG

SANTY CENTRE ORTHOPEDIQUE LYON-FRANCE QUI SOMMES-NOUS ?

chu saint étienne

APHM Assistance Publique Hôpitaux de Marseille

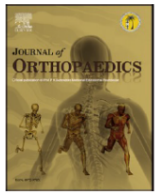
BIBLIOGRAPHY

Journal of Orthopaedics 34 (2022) 21–30

Contents lists available at ScienceDirect

Journal of Orthopaedics

journal homepage: www.elsevier.com/locate/jor



The management of combined ACL and MCL injuries: A systematic review

Raunak Rao *, Rahul Bhattacharyya, Barry Andrews, Rajat Varma, Alvin Chen

Orthopaedics and Trauma, King's College Hospital, Denmark Hill, London, SE5 9RS, United Kingdom

Conclusion: **Heterogeneous outcome measures and limited randomised controlled trials** prevent advocacy of a single treatment option. Good outcomes have been reported from repair, reconstruction and conservative management of the MCL together with ACL reconstruction. Further prospective comparative data is required to evaluate MCL management choice and prognostic signs for successful nonsurgical MCL treatment.

BIBLIOGRAPHY

Result according to ACL treatment

Non operative treatment of ACL + MCL treatment (none/repair/reconstruction)

Bad results in all cases

- RTP (29%)
- Re-injuries

Systematic Review

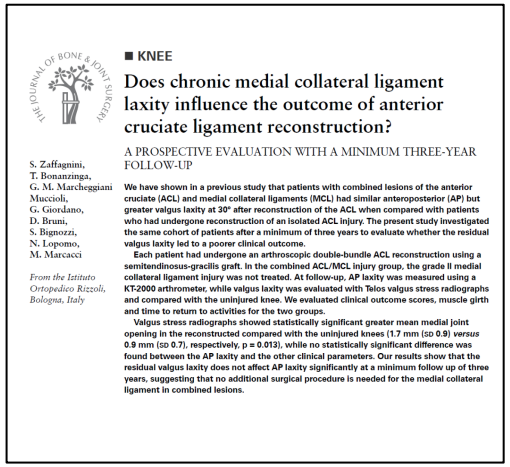
Combined Anterior Cruciate Ligament and Medial Collateral Ligament Reconstruction Shows High Rates of Return to Activity and Low Rates of Recurrent Valgus Instability: An Updated Systematic Review

Margaret L. Wright, M.D., Carlo Coladonato, M.S., Michael G. Ciccotti, M.D., Fotios P. Tjoumakaris, M.D., and Kevin B. Freedman, M.D., M.S.C.E

ACL reconstruction is mandatory whatever is the LCM managment

BIBLIOGRAPHY

Result according to LCM injury grading
Grade 1 et 2



■ KNEE

Does chronic medial collateral ligament laxity influence the outcome of anterior cruciate ligament reconstruction?

A PROSPECTIVE EVALUATION WITH A MINIMUM THREE-YEAR FOLLOW-UP

S. Zaffagnini, T. Bonanzinga, G. M. Marcheggiani Muccioli, G. Giordano, D. Bruni, S. Bignozzi, N. Lopomo, M. Marcacci

From the Istituto Ortopedico Rizzoli, Bologna, Italy

We have shown in a previous study that patients with combined lesions of the anterior cruciate (ACL) and medial collateral ligaments (MCL) had similar anteroposterior (AP) but greater valgus laxity at 30° after reconstruction of the ACL when compared with patients who had undergone reconstruction of an isolated ACL injury. The present study investigated the same cohort of patients after a minimum of three years to evaluate whether the residual valgus laxity led to a poorer clinical outcome.

Each patient had undergone an arthroscopic double-bundle ACL reconstruction using a semitendinosus-gracilis graft. In the combined ACL/MCL injury group, the grade II medial collateral ligament injury was not treated. At follow-up, AP laxity was measured using a KT-2000 arthrometer, while valgus laxity was evaluated with Telos valgus stress radiographs and compared with the uninjured knee. We evaluated clinical outcome scores, muscle girth and time to return to activities for the two groups.

Valgus stress radiographs showed statistically significant greater mean medial joint opening in the reconstructed compared with the uninjured knees (1.7 mm (SD 0.9) *versus* 0.9 mm (SD 0.7), respectively, p = 0.013), while no statistically significant difference was found between the AP laxity and the other clinical parameters. Our results show that the residual valgus laxity does not affect AP laxity significantly at a minimum follow up of three years, suggesting that no additional surgical procedure is needed for the medial collateral ligament in combined lesions.

Prospectif recul 3 ans

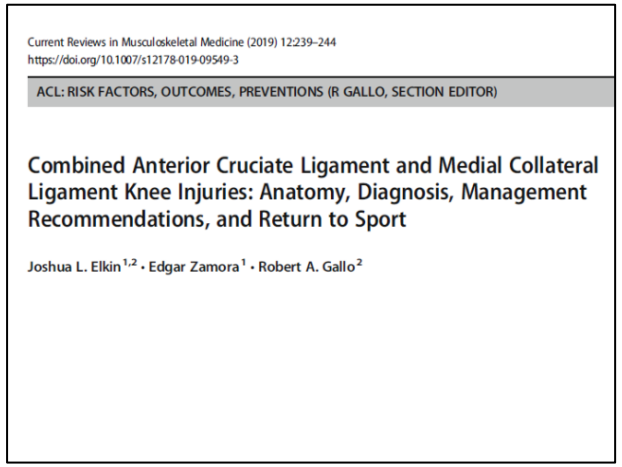
Do Clinical Outcomes and Failure Rates Differ in Patients With Combined ACL and Grade 2 MCL Tears Versus Isolated ACL Tears?

A Prospective Study With 14-Year Follow-up

Gian Andrea Lucidi,*† MD, Piero Agostinone,† MD, Alberto Grassi,† MD, PhD, Stefano Di Paolo,‡ Eng, Giacomo Dal Fabbro,† MD, Tommaso Bonanzinga,§‖ MD, PhD, and Stefano Zaffagnini,† Prof., MD

Investigation performed at IRCCS Istituto Ortopedico Rizzoli, Bologna, Italy

Prospectif recul 14 ans



Current Reviews in Musculoskeletal Medicine (2019) 12:239–244
https://doi.org/10.1007/s12178-019-09549-3

ACL: RISK FACTORS, OUTCOMES, PREVENTIONS (R GALLO, SECTION EDITOR)

Combined Anterior Cruciate Ligament and Medial Collateral Ligament Knee Injuries: Anatomy, Diagnosis, Management Recommendations, and Return to Sport

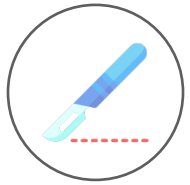
Joshua L. Elkin[1,2] · Edgar Zamora[1] · Robert A. Gallo[2]

Méta-analyse

Results ACL + MCL grade1 / 2 conservative treatment = equal to isolated ACL

BIBLIOGRAPHY

Result according to LCM injury grading
Grade 3



Depending of the tear location on MCL

- Distal and midsubstance ⇨ surgery (plasty > repair)
- Femoral insertion ⇨ surgery = conservative

Systematic Review

Combined Anterior Cruciate Ligament and Medial Collateral Ligament Reconstruction Shows High Rates of Return to Activity and Low Rates of Recurrent Valgus Instability: An Updated Systematic Review

Margaret L. Wright, M.D., Carlo Coladonato, M.S., Michael G. Ciccotti, M.D., Fotios P. Tjoumakaris, M.D., and Kevin B. Freedman, M.D., M.S.C.E

HHS Public Access

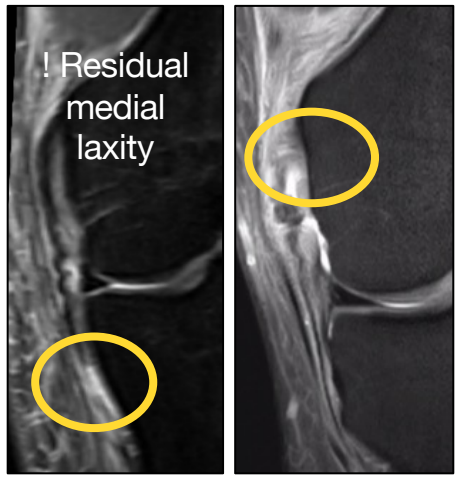
Author manuscript

Arthroscopy. Author manuscript; available in PMC 2020 May 01.

Published in final edited form as:

Arthroscopy. 2019 May ; 35(5): 1466–1472. doi:10.1016/j.arthro.2018.10.138.

Outcomes of Grade III MCL Injuries Treated Concurrently with ACL Reconstruction: A Multicenter Study



distal / mid subst. grade 3 MCL = SURGERY | Femoral tear = conservative

BIBLIOGRAPHY

Result according to LCM injury grading
Grade 3

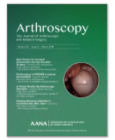
Result according to MCL management

- No difference : functional scores
- RTP and re-rupture rates (controversy)
- No differnce ROM
  (knee stifness = old surgical techniques)
- Residual medial laxity = less if MCL plasty

Nonoperative Management, Repair, or Reconstruction of the Medial Collateral Ligament in Combined Anterior Cruciate and Medial Collateral Ligament Injuries—Which Is Best?

A Systematic Review and Meta-analysis

Christopher L. Shultz,* MD, Emily Poehlein,† MB, Nicholas J. Morriss,‡§ BA, Cynthia L. Green,† PhD, Jessica Hu,‖ Sarah Lander,‖ MD, Kelms Amoo-Achampong,‖ MD, and Brian C. Lau,‖ MD
Investigation performed at Duke University Medical Center, Durham, North Carolina, USA

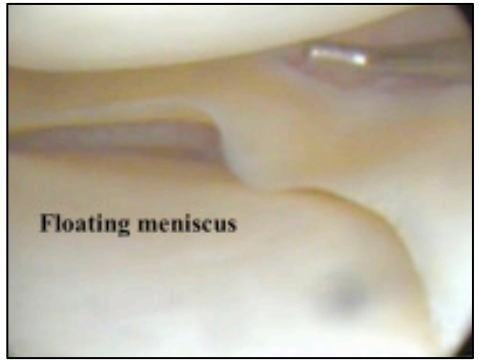


The Presence of the Arthroscopic "Floating Meniscus" Sign as an Indicator for Surgical Intervention in Patients With Combined Anterior Cruciate Ligament and Grade II Medial Collateral Ligament Injury

Arthroscopy: The Journal of Arthroscopic & Related Surgery
Volume 35, Issue 3, March 2019, Pages 930-937

Early medial reconstruction combined with severely injured medial collateral ligaments can decrease residual medial laxity in anterior cruciate ligament reconstruction

Arthroscopy and Sports Medicine | Published: 03 November 2021 | 142, 2791–2799 (2022)



BIBLIOGRAPHY

Result according to LCM injury grading
Grade 3

Result according to MCL management

- ACL rec. + conservative MCL = increase the risk of ACL revison
  (cause = laxité médiale résiduelle augmente tension greffe LCA)
- ACL rec.+ MCL rec. = isolated ACL
- But …

Knee Surgery, Sports Traumatology, Arthroscopy (2019) 27:2450–2459
https://doi.org/10.1007/s00167-018-5237-3

KNEE

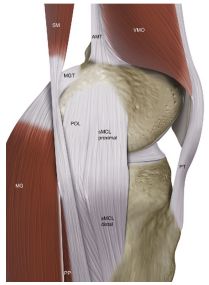
CrossMark

Increased risk of ACL revision with non-surgical treatment of a concomitant medial collateral ligament injury: a study on 19,457 patients from the Swedish National Knee Ligament Registry

Eleonor Svantesson[1] · Eric Hamrin Senorski[2] · Eduard Alentorn-Geli[3,4,5] · Olof Westin[1,6] · David Sundemo[1] · Alberto Grassi[7,8] · Svemir Čustović[9] · Kristian Samuelsson[1,6]

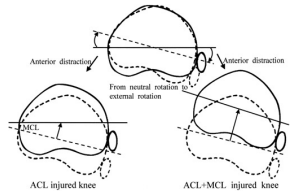
What you need to treat association ACL + « MCL » ?

ANATOMY STATUS



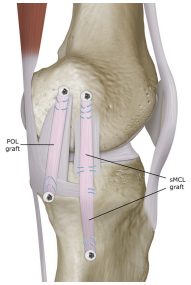
- **sMCL**
- **dMCL**
- **POL**

BIOMECA



- **Varus**
  - À 30°: sMCL +++ & dMCL
  - À 0°: POL
- **Rotation** = dMCL
- **Translation** = dMCL

Surgical TREATMENT



- sMCL: tibia 6cm under joint line
  - Tensioned 30° flexion
- dMCL: reverse ALL (miroir)
- POL: post / fem. epicondyle
  - Tensioned 0° flexion

Surgery for whom ?

ACL + MCL GRADE 1

= *PAIN without LAXITY*

DO NOT FIX THE MCL!

NO GO !

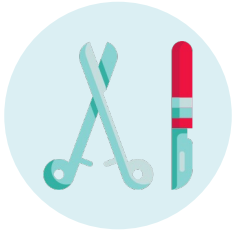
Surgery for whom ?

ACL + MCL GRADE 2

NO MEDIAL Laxity in EXTENSION but slight to moderate laxity @ 20° of flexion

Delayed SURGERY stifness , …

→ NO. MCL treatment



Early ACL reconstruction

→ **MCL REPAIR especially if …**

- Sport activity
- Distal MCL or MCL entrapment

Surgery for whom ?

ACL + MCL GRADE 3

(MEDIAL laxity in flexion AND in extension)

GO for SURGERY

Otherwise = chronic laxity and bad functionnal results

Quit SOON

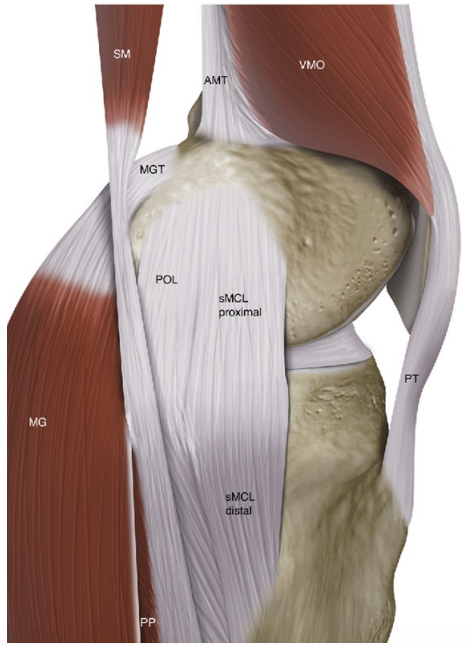
Repair if you can in acute

… sometime difficult due to the pain / knee aspect (« new / second « trauma +++)

If not possible : secondary reconstruction associated witl ACL rec on a « calm » knee

PLAN

ANATOMY



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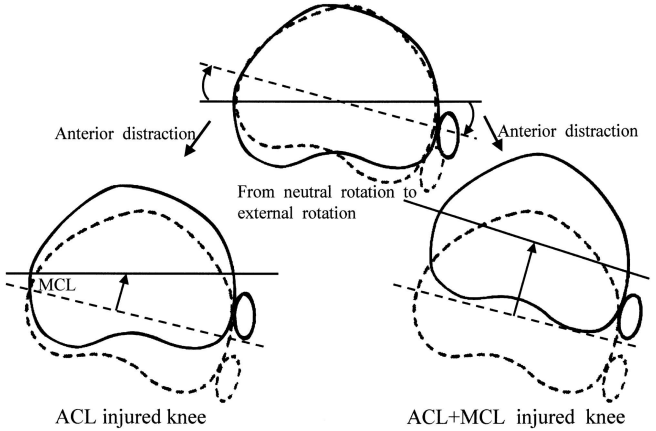
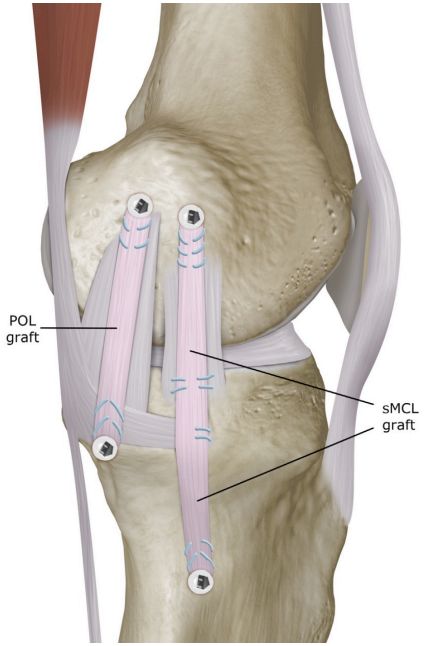
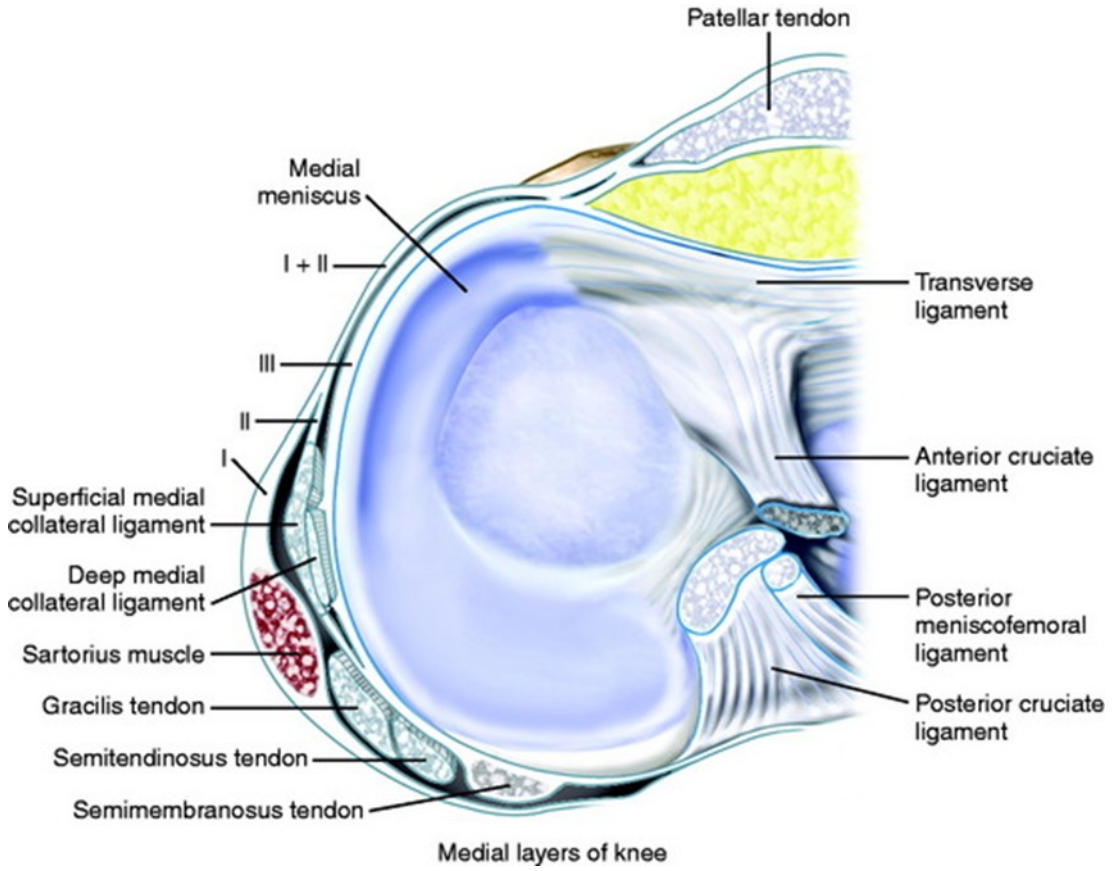


SURGICAL PLAN



ANATOMY



Medial layers of knee

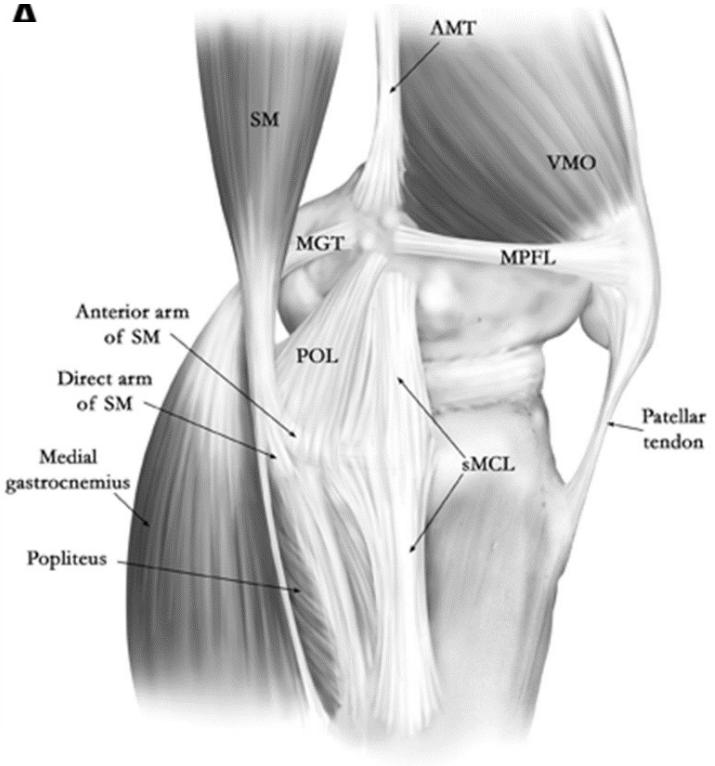
3 LAYERS

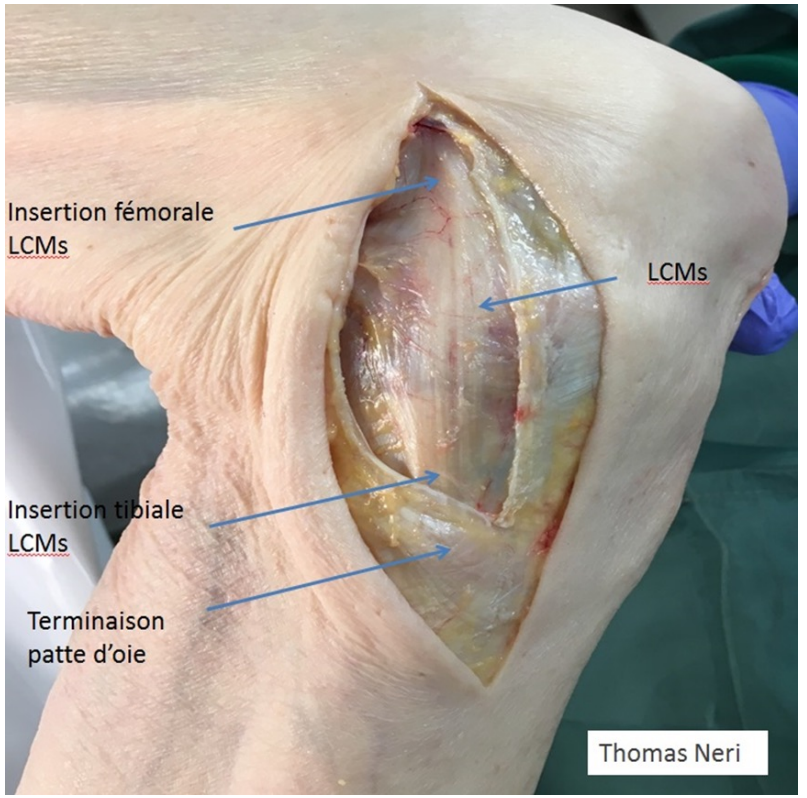
Medial Structures of Knee	
Layer I	**Sartorius and fascia (patellar retinaculum)** gracilis, semitendinosis, and saphenous nerve run between layer 1 and 2
Layer 2	Semimembranosus, **superficial MCL**, MPFL, **posterior oblique ligament**
Layer 3	**Deep MCL**, capsule, coronary ligament

ANATOMY

INTERMEDIATE LAYER

- sMCL
- POL
- SM
- ST, gracilis

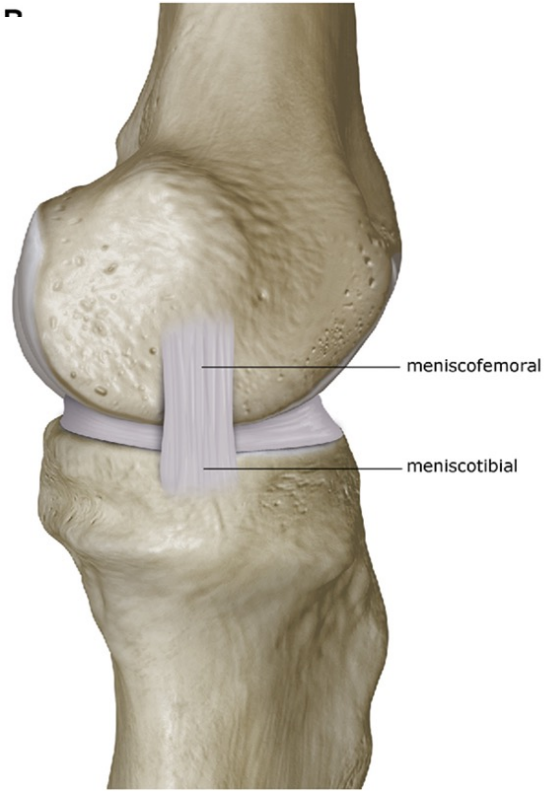


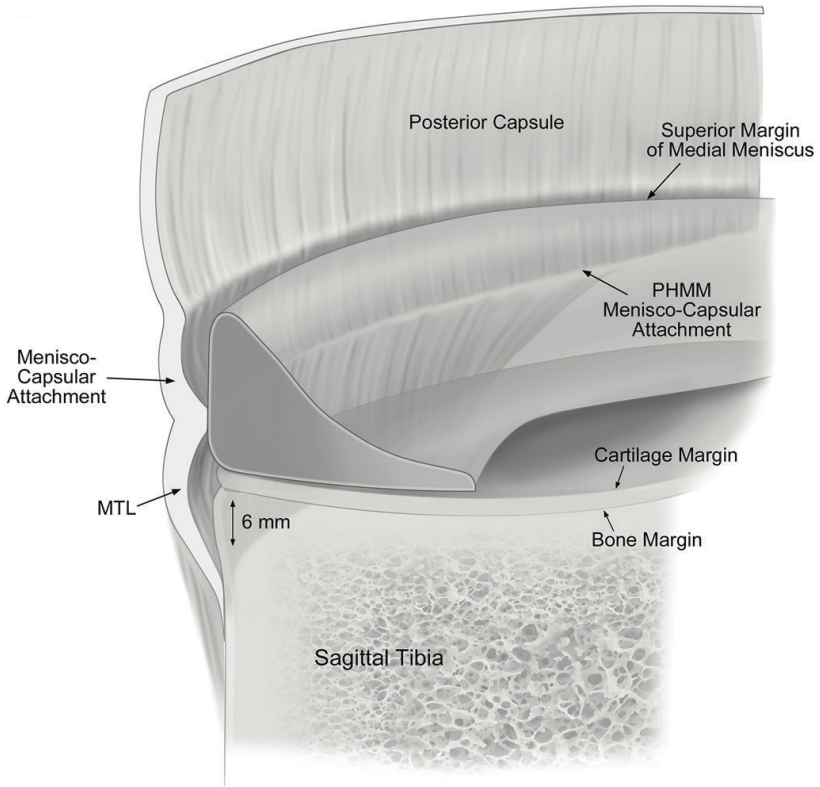


ANATOMY

DEEP LAYER

- dMCL
- capsule
- Ligament menisco-tibial
- Ligament capsulo-meniscal





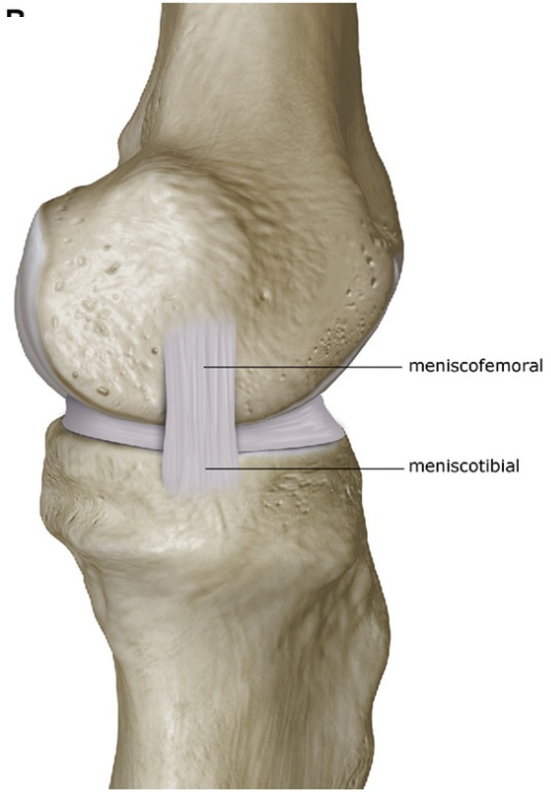
ANATOMY

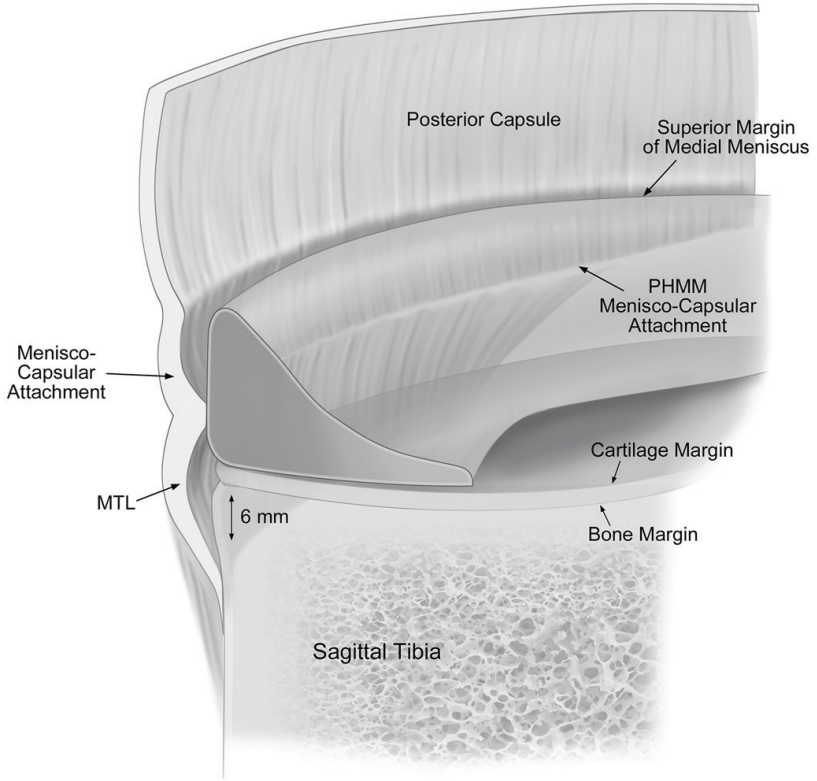
DEEP MCL (dMCL)

Stabilization of ANTERIOR TRANSLATION 1 VALGUS

2 contingents :

- Menisco-femoral
- Menisco-tibial





ANATOMY

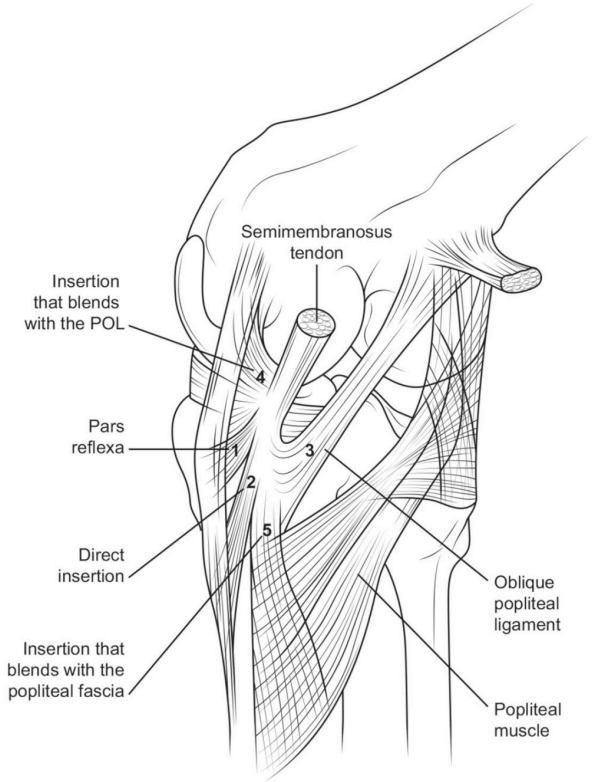
POSTERO-MEDIAL CORNER

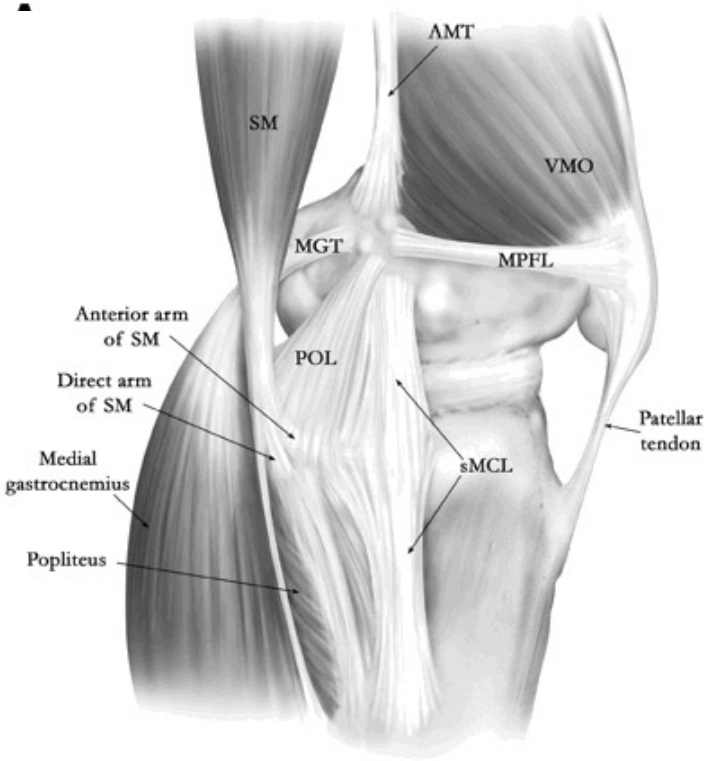
Posterior Oblique Ligament (POL):

- Femur: Post-distale tubercule ADD
- Tibia: SM tendon

PM articular capsule

Posterior part of the medial meniscus





ANATOMY

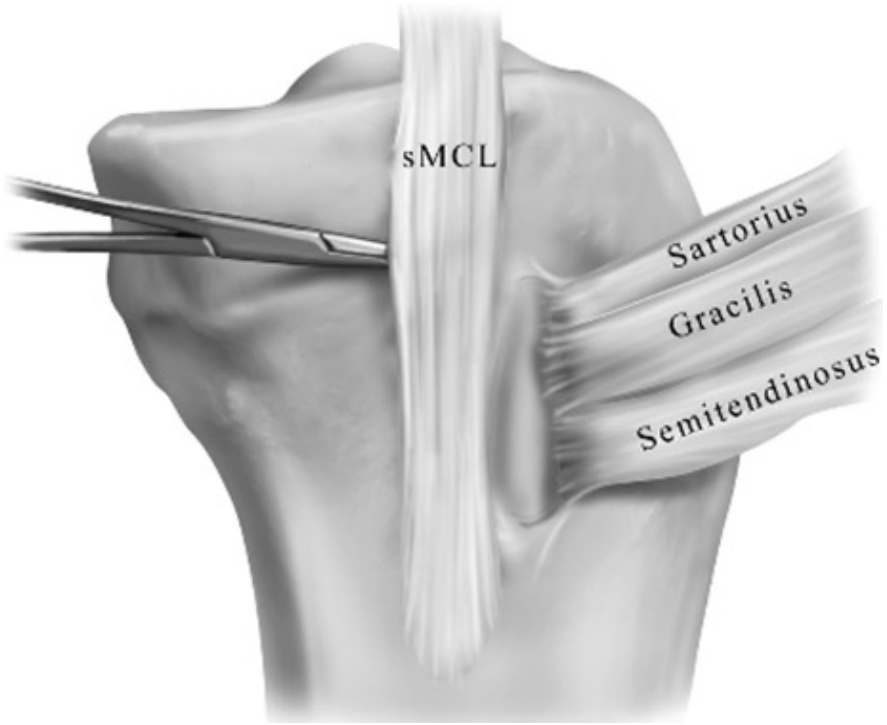
Semi membranosus

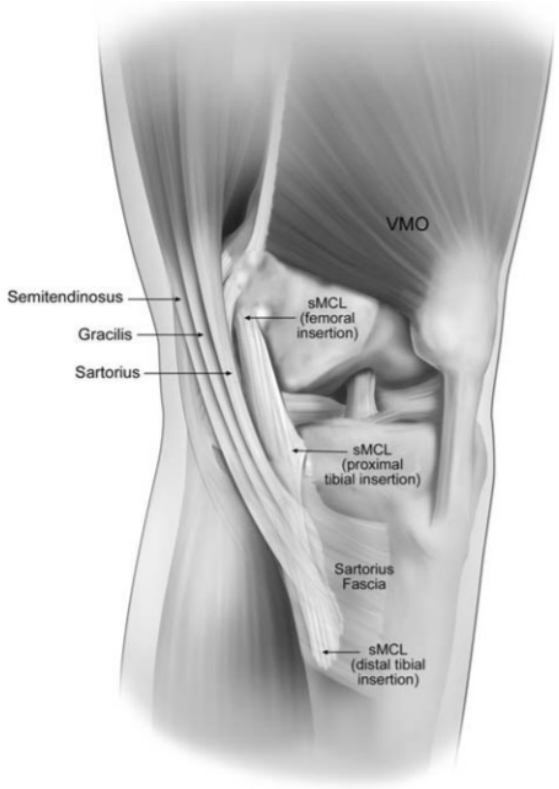
Sartorius

Semi tendinosus

Gracilis

- SECONDAIRY restrain in valgus
- GRAFTS choices



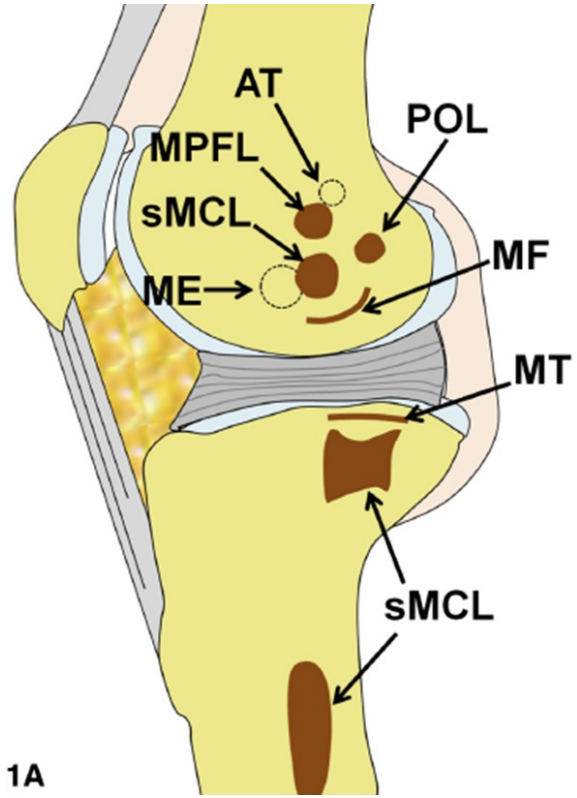


SURGICAL TECHNIQUES

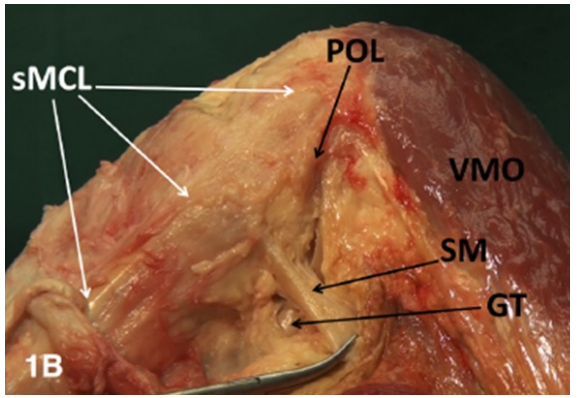
RESPECT the ANATOMY

REPAIR
(reinsertion)

RECONSTRUCTION
(graft)



1A



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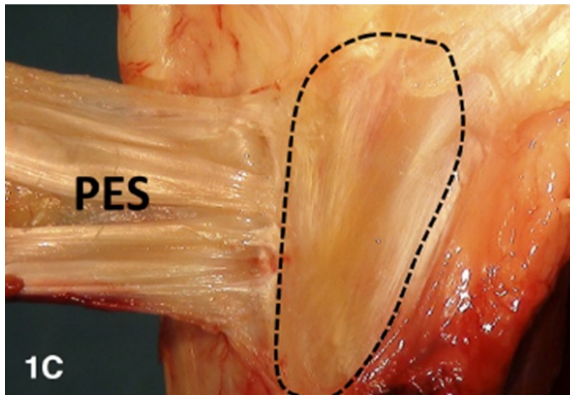


1C

Restrain Valgus, Rotation & Translation

VARUS

@ 30°: sMCL +++ & dMC

@ 0°: POL

ROTATION

dMCL

TRANSLATION

Association of structures (dMCL +++)

BIOMECA

INTACT KNEE

- Pas de laxité en extension
- Laxité physiologique à 30°

VALGUS @ 30°

- sLCM ++++
- dLCM

VALGUS @ 0°

- POL

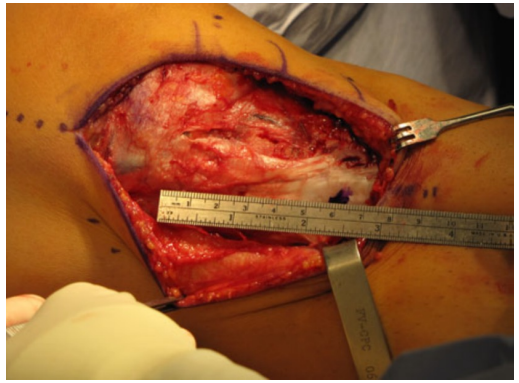
AMRI & TRANSLATION

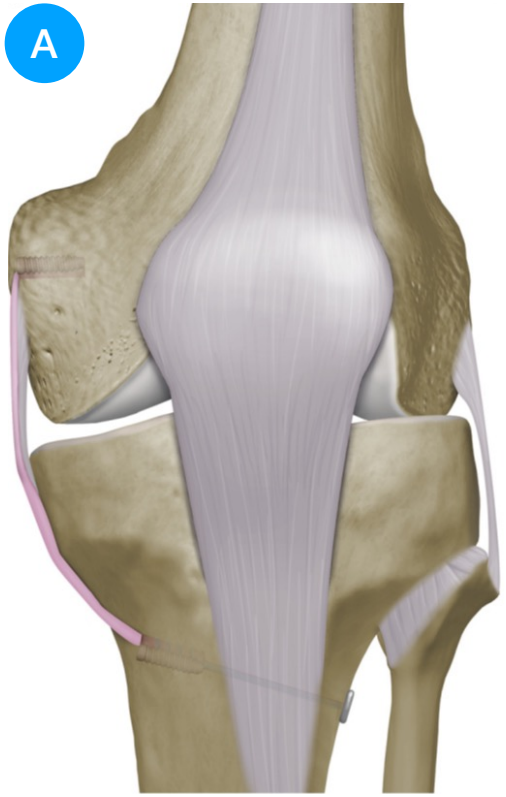
- dLCM

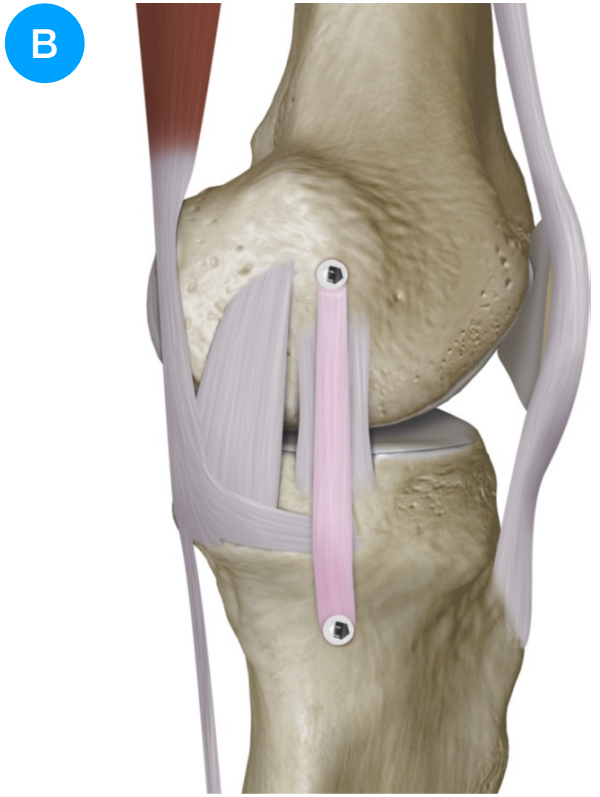
SURGICAL MANAGEMENT

sMCL

TIBIAL Tunnel : 6cm above the joint line







SURGICAL MANAGEMENT

dMCL

Femoral tunnel

- 6 mm distal
- 5 mm postérieur
- // MEDIAL epicondyle

Tibial tunnel:

- 8 mm below the joint line

The Mirror Anterolateral Ligament: A Simple Technique to Reconstruct the Deep Medial Collateral Ligament Using the Gracilis Associated With a Four-Strand Semitendinosus for Anterior Cruciate Ligament Reconstruction

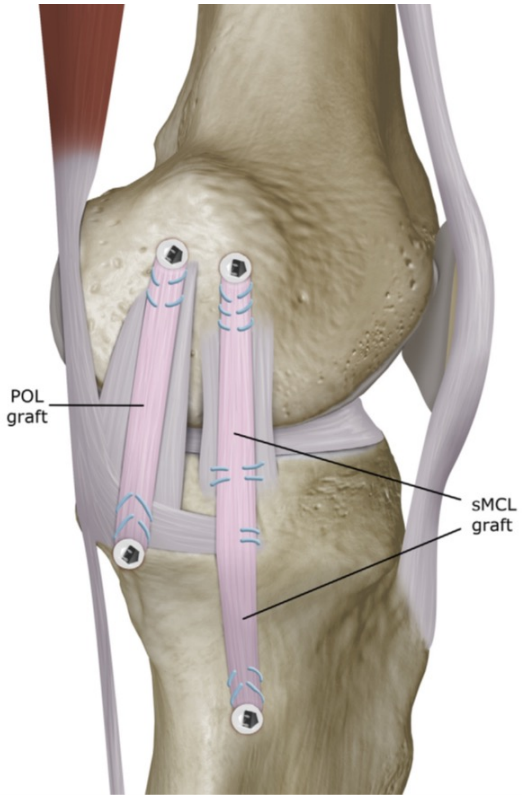
Jérémy Daxhelet, M.D., Nicolas Bouguennec, M.D., and Nicolas Graveleau, M.D.

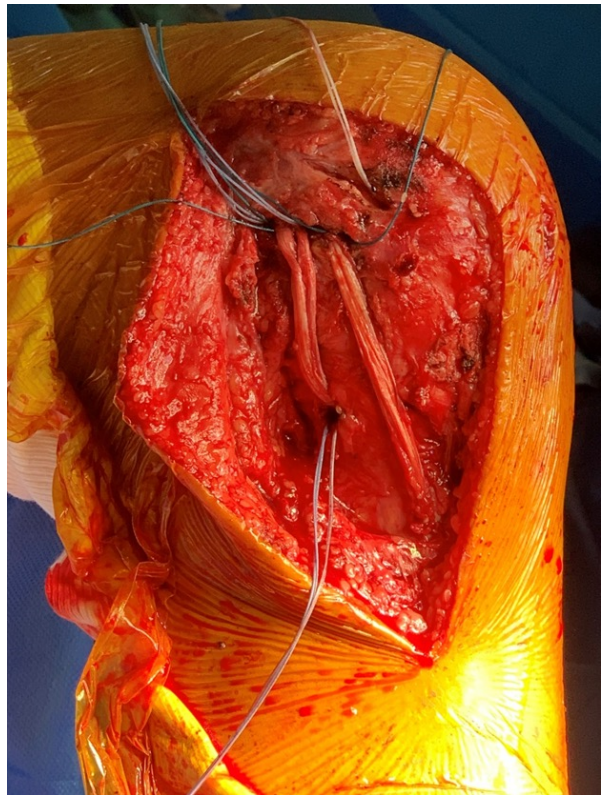
SURGICAL MANAGEMENT

MCL + POL

Anatomic +++

- 2 bundles
- 2 femoral tunnels





FOCUS

A New Algorithm to Treat Chronic Combined ACL/MCL Injuries: Let's Come Back to the "Rotatory Instability Test"

Nicolas Bouguennec,*† MD, Thibault Marty-Diloy,† MD, Philippe Colombet,† MD, Nicolas Graveleau,† MD, and James Robinson,‡ FRCS(Orth), MS
Investigation performed at Clinique du Sport, Bordeaux-Merignac, France

- Back to a simple test, the "Rotatory Instability Test" as described by Slocum and Larson in 1968
- Improve the sensitivity and accuracy of the deep MCL (dMCL) and superficial MCL (sMCL) examination
- Allow to propose a decision-making algorithm for the treatment of the chronic combined ACL/MCL injuries based on the assessment of anteromedial rotatory instability (AMRI).

SUPERFICIAL MCL DEEP MCL AND ANTERIOR DRAWER

The Role of the Medial Collateral Ligament and Posteromedial Capsule in Controling Knee Laxity

James R. Robinson et al.

The American Journal of Sports Medicine 2006

1.Intact→sMCL→dMCL→PMC

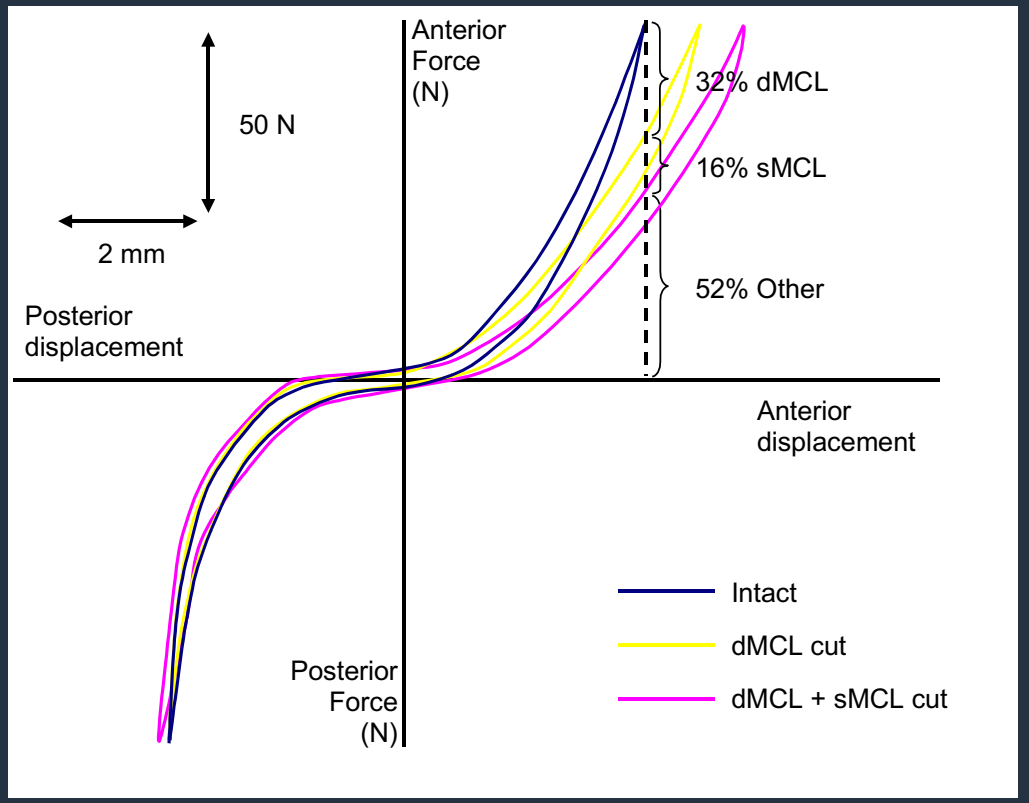
2. Intact→dMCL→PMC→sMCL

3.Intact→PMC→sMCL→dMCL

Dr James ROBINSON

ATT @150N in all combination : NO SIGNIFICATIVE DIFFERENCE in NEUTRAL ROTATION

If you fix the tibia in EXTERNAL ROTATION : dMCL 32% contribution to ATT restiction à la restriction de la translation antérieure



BASICS : CAUTIOUS CLINICAL EXAMINATION

Examination of the **ACL injury**

- Lachman test
- Anterior drawer in neutral rotation
- Pivot shift test confirm the ACL injury

Examination of **MEDIAL structures** *(sMCL, dMCL, POL , « capsule »)*

- Valgus laxity in full knee extension
- Valgus laxity at 20° of flexion
- Anterior drawer test at 90° of flexion in external rotation ***[ADER] test***

Allowing to identify isolated dMCL, dMCL + sMCL, or MCL + POL injuries.

AMRI : ANTERO MEDIAL ROTATIONAL INSTABILITY

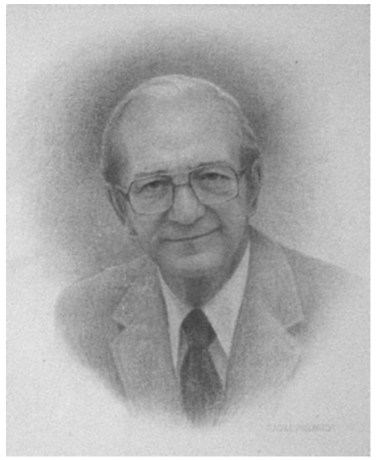
Factors for the presence of anteromedial rotatory instability of the knee

Makoto Kurimura[1], Hideo Matsumoto[1], Kyosuke Fujikawa[2], and Yoshiaki Toyama[1]

TWO different definition of AMRI:

1. Excessive anterior translation with an externaly rotated tibia in CLINICAL studies
2. Increase in external tibial rotation in most BIOMECHANICAL studies

This difference has caused confusion in the understanding of AMRI.



Dr. Donald B. Slocum

Rotatory Instability of the Knee

*Its Pathogenesis and a Clinical Test to Demonstrate Its Presence**

Donald B. Slocum, MD; and Robert L. Larson, MD

J Bone Joint Surg [Am] 1968

Dr. Robert L. Larson

The ligamentous structures of the medial side of the knee are composed of the capsular ligaments and an overlying tibial collateral ligament which reinforces the medial aspect of the joint.

Rotatory instability of the knee permitting **abnormal external rotation of the tibia on the femur** is the result of forced abduction of the flexed knee and external rotation of the tibia. **Rotatory instability** is a functional deficit and is but a segment of a more general **involvement of the meniscoligamentous system.**

This agrees … with the experimental work of Kennedy who demonstrated that forced external rotation of the flexed knee results in consistent rupture of the **deep capsular portion of the medial ligament**.

The **rotatory instability test** is said to be **positive** when pathologically increased **forward and outward displacement** of the tibia on the femur is possible when the tibia is pulled forward while externally rotated 15 degrees, with the knee flexed to right angles and the foot supported to eliminate gravitational tension.

CLINICAL examination : ADER TEST

3 - Rotational laxity controle

- Who check EDL ?
- AMRI = ANTERO-MEDIAL ROTATORY INSTABILITY
  - Exces of ATT + ER
  - Lack of consensus on role of POL & PM capsule
- ADER test = Anteriro drawer test in EXTERNAL ROTATION of 15°
- Make difference between sMCL & dMCL

Courtesy N. Bouguennec

Could exist even without medial laxity in isolated dMCL lesion

What does it take to have a high-grade pivot shift?, M. Tanaka, KSSTA, 2012

Video Journal of Sports Medicine
Volume 3, Issue 5, September-October 2023

https://doi.org/10.1177/26350254231204385

Sage Journals

ACL Study Group Special Issue

A New Algorithm to Treat Chronic Combined ACL/MCL Injuries: Let's Come Back to the "Rotatory Instability Test"

Nicolas Bouguennec, MD †,*, Thibault Marty-Diloy, MD †, Philippe Colombet, MD†, Nicolas Graveleau, MD†, and James Robinson, FRCS(Orth), MS‡

ACL + MCL CHRONIC INJURIES

(ACL surgery planed)

Valgus laxity in extension

No

Yes → ACL + MCL + POL surgery

AMRI Classification with a « Modified Wierer classification »

Anterior Drawer in External Rotation Test (ADER TEST)
+ Valgus stress test at 20° of flexion

GRADE	0	I	II	III
ADER TEST	-	+	++	+++
VALGUS LAXITY at 20° of flexion	-	-	+	+++

= Isolated ACL recon.

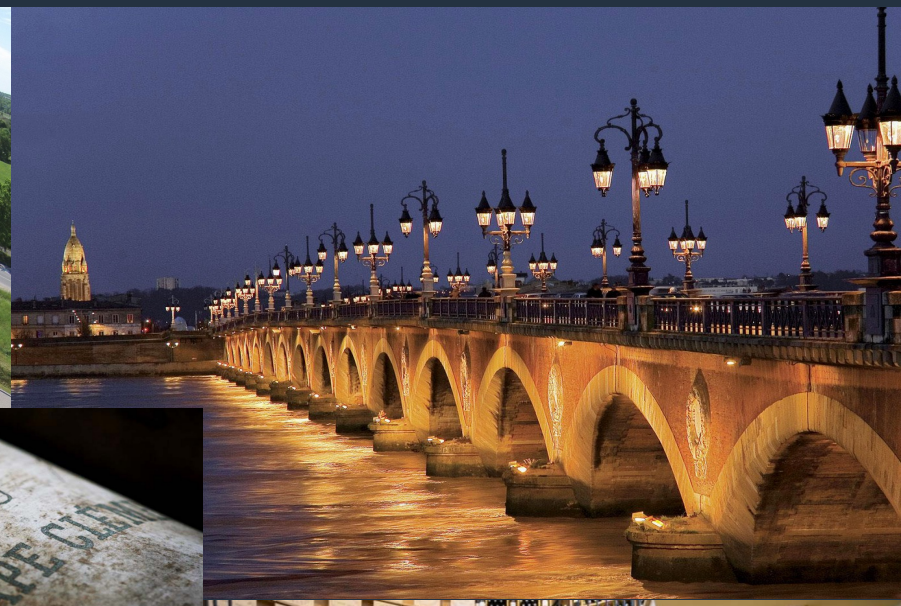
dMCL injury
+/- no or minimal sMCL injury
= ACL + dMCL reconstruction

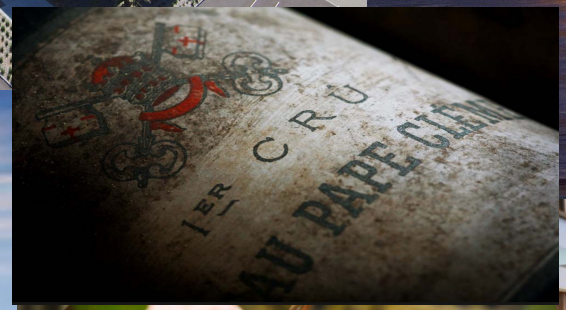
dMCL and significant sMCL injury
= ACL + dMCL + sMCL reconstruction

MERISCIENCE

Centre de Chirurgie
Orthopédique et Sportive
Bordeaux Mérignac - Rocade sortie 12

Merci et bienvenus à BORDEAUX!





SFA 2024

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DÉCEMBRE 11/12/13/14

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  Mikaël CHELLI, Guillaume VILLATTE
- Reprise du sport après LCA.
  Benjamin FREYCHET, Camille CHOUFANI
- SMILE, Mini instabilité latérale épicondylienne du coude
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