

ALGORITHM TO TREAT COMBINED ACL/MCL/ AMRI INJURIES : LET'S RETURN TO THE “ROTATORY INSTABILITY TEST”

N. Graveleau¹, N. Bouguennec¹, T. Marty-Diloy¹, J. Robinson²

¹ Clinique du Sport, Bordeaux-Merignac, France

² Knee Specialists, Bristol, UK

Disclosures

None of the authors have any relationships to disclose with either companies or products listed in this presentation

Overview

- Combined MCL and ACL injuries are frequent
- Residual Medial laxity is a risk factor for ACL re-rupture
- So treating residual medial laxity for chronic ACL rupture is reasonable

Willinger 2022

Svantesson 2019

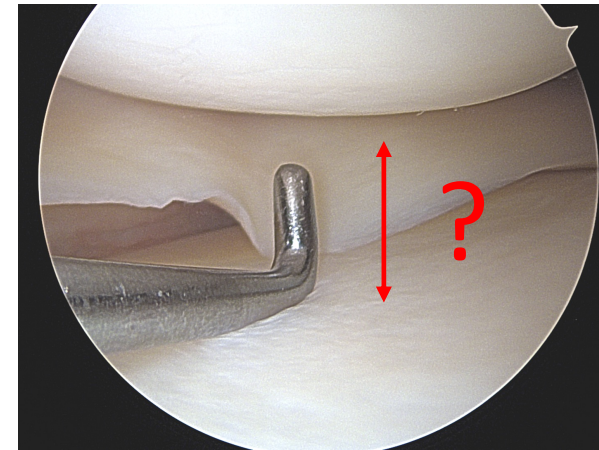
- Butwhich to treat ? How ?

- Grade 1 Fetto & Marshall → Consensus = Conservative treatment
- Grade 3 → Surgery is indicated
- Grade 2 → ?

Consensus Chahla et al. 2020

Consensus Guenther et al. 2021

- sMCL / dMCL reconstruction may improve medial laxity
..... but weighed against the risk of STIFFNESS



Overview

- Combined ACL+MCL lesions may lead to persistent ER laxity with potential AMRI if MCL non repaired/healed *Ball 2020*
- However, the AnteroMedial Rotatory Instability (AMRI) is not routinely assessed by clinicians *Sirisena 2016*
- A classification of AMRI was proposed by Wierer et al. in 2020
- The Anteromedial Drawer test was described by Slocum and Larson in 1968
= **Anterior Drawer Test In External Rotation (ADER TEST)**
- The test is best performed in 15° of External Rotation *Bargar 1982*
- Devices are not useful for AMRI examination and clinical examination remains the most reproducible *Sirisena 2016*
- We do not use stress fluoroscopy for the diagnostic.

Purpose

Revisit the rotatory instability as described by Slocum and Larson in 1968
(Anterior Drawer Test at 90° of flexion with the foot held in 15° ER
= the ADER Test)
as simple clinical examination to assess sMCL/dMCL rotatory instability



And propose a new algorithm for treatment of combined MCL/ACL injuries
(Especially for combined injuries with AMRI)

Algorythm proposal

ACL + MCL CHRONIC INJURY (ACL surgery planed)



No



Valgus laxity in extension

Yes

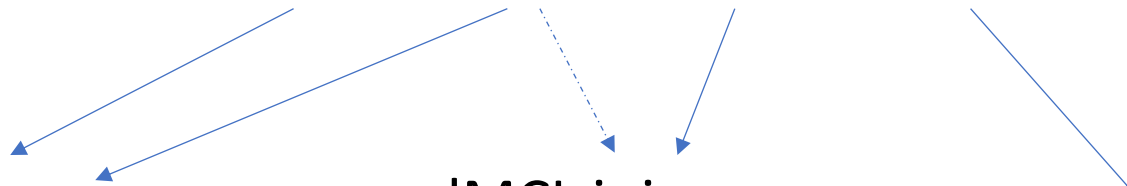
ACL + MCL + POL surgery

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

Algorythm proposal

ACL + MCL CHRONIC INJURY (ACL surgery planed)



No ← Valgus laxity in extension → Yes

ACL + MCL + POL surgery
Quite RARE

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

Algorythm proposal

ACL + MCL CHRONIC INJURY (ACL surgery planed)



No



Valgus laxity in extension

Yes

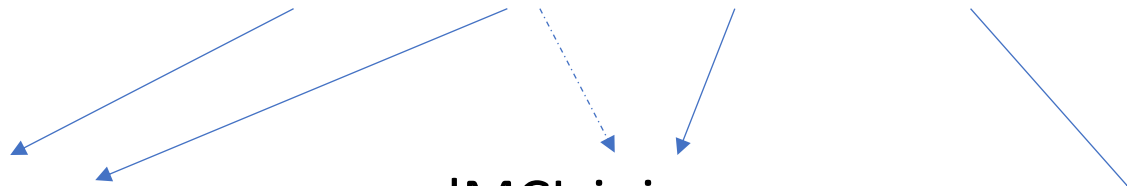
ACL + MCL + POL surgery

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

Example of an isolated ACL injury – No MCL injury



Algorythm proposal

ACL + MCL CHRONIC INJURY (ACL surgery planed)



No



Valgus laxity in extension

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

Algorythm proposal

ACL + MCL CHRONIC INJURY (ACL surgery planed)



No



Valgus laxity in extension

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

Algorythm proposal

ACL + MCL CHRONIC INJURY (ACL surgery planed)



No



Valgus laxity in extension

Yes

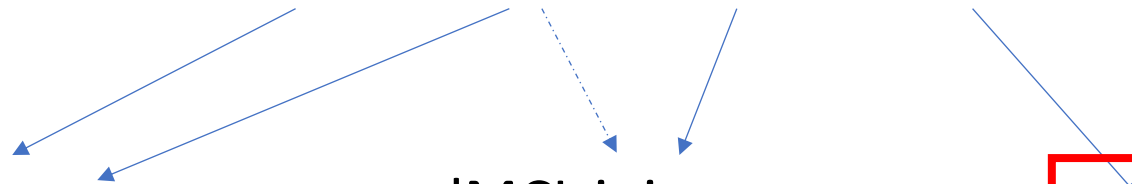
ACL + MCL + POL surgery

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

Example of dMCL + sMCL + ACL injury



Algorythm proposal

ACL + MCL CHRONIC INJURY (ACL surgery planed)



No



Valgus laxity in extension

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

Example of isolated dMCL + ACL injury



*Postoperative examination after isolated dMCL + ACL reconstruction
for a patient with dMCL and ACL injury*



Recent technical considerations for MCL surgery

- For isolated dMCL / AM structures reconstruction associated to an ACL reconstruction, a gracilis (two-strand) can be used percutaneously for the dMCL. *Dexhelet 2021*
- For dMCL+sMCL reconstruction, an anteromedial reconstruction using gracilis can be performed to control ER *Wierer 2022* and can be combined with a flat sMCL reconstruction to biomechanically best restore medial knee stability. *Behrendt 2022*
- In all MCL surgeries, the position of femoral insertion of the graft is critical. So, X-ray should be used during the surgery to accurately determine the landmark for insertion on the medial femoral condyle.

Take Home Messages

- Not all MCL injuries require surgical intervention when injured with the ACL for chronic cases.
- Therefore, more accurate evaluation of MCL injuries is necessary to determine between conservative or surgical treatment of the medial side.
- Clinical examination of a knee with an ACL injury should include systematically an examination of a potential AMRI especially with the ADER Test (*Anterior Drawer in External Rotation Test*) ever described in 1968 by Slocum and Larson to better evaluate dMCL and sMCL injuries.
- We propose a new algorithm based on a modified Wierer classification to help to decide when to do :
 - Either...No MCL reconstruction
 - Or... isolated dMCL reconstruction with ACLR
 - Or...sMCL+dMCL reconstruction with ACLR

References

- Bargar, W. L., Moreland, J. R., Markolf, K. L., & Shoemaker, S. C. (1983). The effect of tibia-foot rotatory position on the anterior drawer test. *Clin Orthop Relat Res*(173), 200-203. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/6825334>
- Battaglia, M. J., 2nd, Lenhoff, M. W., Ehteshami, J. R., Lyman, S., Provencher, M. T., Wickiewicz, T. L., & Warren, R. F. (2009). Medial collateral ligament injuries and subsequent load on the anterior cruciate ligament: a biomechanical evaluation in a cadaveric model. *Am J Sports Med*, 37(2), 305-311. doi:10.1177/0363546508324969
- Behrendt, P., Herbst, E., Robinson, J. R., von Negenborn, L., Raschke, M. J., Wermers, J., . . . Kittl, C. (2022). The Control of Anteromedial Rotatory Instability Is Improved With Combined Flat sMCL and Anteromedial Reconstruction. *Am J Sports Med*, 50(8), 2093-2101. doi:10.1177/03635465221096464
- Chahla, J., Kunze, K. N., LaPrade, R. F., Getgood, A., Cohen, M., Gelber, P., . . . Robinson, J. (2021). The posteromedial corner of the knee: an international expert consensus statement on diagnosis, classification, treatment, and rehabilitation. *Knee Surg Sports Traumatol Arthrosc*, 29(9), 2976-2986. doi:10.1007/s00167-020-06336-3
- Daxhelet, J., Bouguennec, N., & Gravelau, N. (2022). 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. *Arthrosc Tech*, 11(8), e1419-e1424. doi:10.1016/j.eats.2022.03.030
- Fetto, J. F., & Marshall, J. L. (1978). Medial collateral ligament injuries of the knee: a rationale for treatment. *Clin Orthop Relat Res*(132), 206-218. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/679543>
- Guenther, D., Pfeiffer, T., Petersen, W., Imhoff, A., Herbolt, M., Achtnich, A., . . . Best, R. (2021). 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). *Orthop J Sports Med*, 9(11), 23259671211050929. doi:10.1177/23259671211050929
- Richter, D. L., McIver, N. D., Sapradi, T., Garcia, J., Mercer, R., Hankins, D. A., . . . Treme, G. (2022). A Biomechanical Comparison of the LaPrade Technique Versus a Novel Technique for Reconstruction of Medial-Sided Knee Injuries. *Am J Sports Med*, 50(8), 2083-2092. doi:10.1177/03635465221094000
- Sirisena, D., Papi, E., & Tillett, E. (2017). Clinical assessment of antero-medial rotational knee laxity: a systematic review. *Knee Surg Sports Traumatol Arthrosc*, 25(4), 1068-1077. doi:10.1007/s00167-016-4362-0
- Slocum, D. B., & Larson, R. L. (1968). Rotatory instability of the knee. Its pathogenesis and a clinical test to demonstrate its presence. *J Bone Joint Surg Am*, 50(2), 211-225. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/5642814>
- Svantesson, E., Hamrin Senorski, E., Alentorn-Geli, E., Westin, O., Sundemo, D., Grassi, A., . . . Samuelsson, K. (2019). 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. *Knee Surg Sports Traumatol Arthrosc*, 27(8), 2450-2459. doi:10.1007/s00167-018-5237-3
- Wierer, G., Milinkovic, D., Robinson, J. R., Raschke, M. J., Weiler, A., Fink, C., . . . Kittl, C. (2021). The superficial medial collateral ligament is the major restraint to anteromedial instability of the knee. *Knee Surg Sports Traumatol Arthrosc*, 29(2), 405-416. doi:10.1007/s00167-020-05947-0
- Willinger, L., Balendra, G., Pai, V., Lee, J., Mitchell, A., Jones, M., & Williams, A. (2022). High incidence of superficial and deep medial collateral ligament injuries in 'isolated' anterior cruciate ligament ruptures: a long overlooked injury. *Knee Surg Sports Traumatol Arthrosc*, 30(1), 167-175. doi:10.1007/s00167-021-06514-x