



7TH Advanced Course on Knee Surgery
14th to 18th January 2018
Val d'Isère – France

Multi-Ligament Injuries Conservative treatment in acute cases

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Where is Telford?

FOOT SURGEON



5thAdvanced
Course on
Knee Surgery

February 2nd – 7th 2014 Val d'Isère







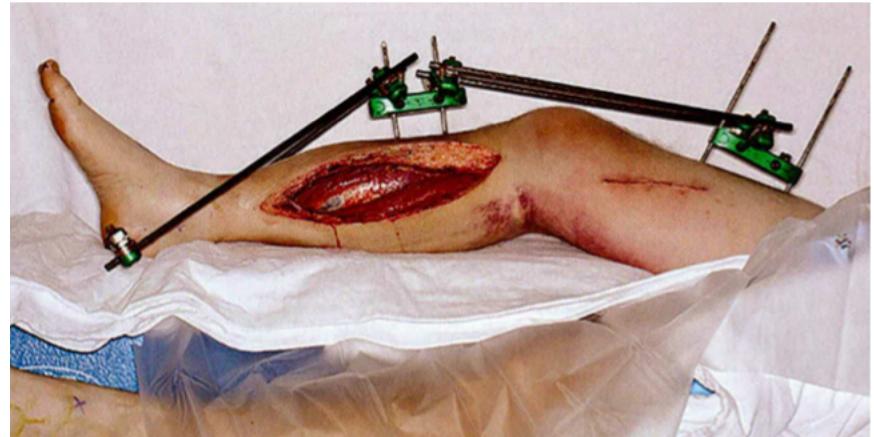
Where are we with our case?

- Had injury
 - Ski
 - Motor vehicle accident, moto cross
 - Fallen over, obese
- Had emergency management
- Examined & imaged
- What next?



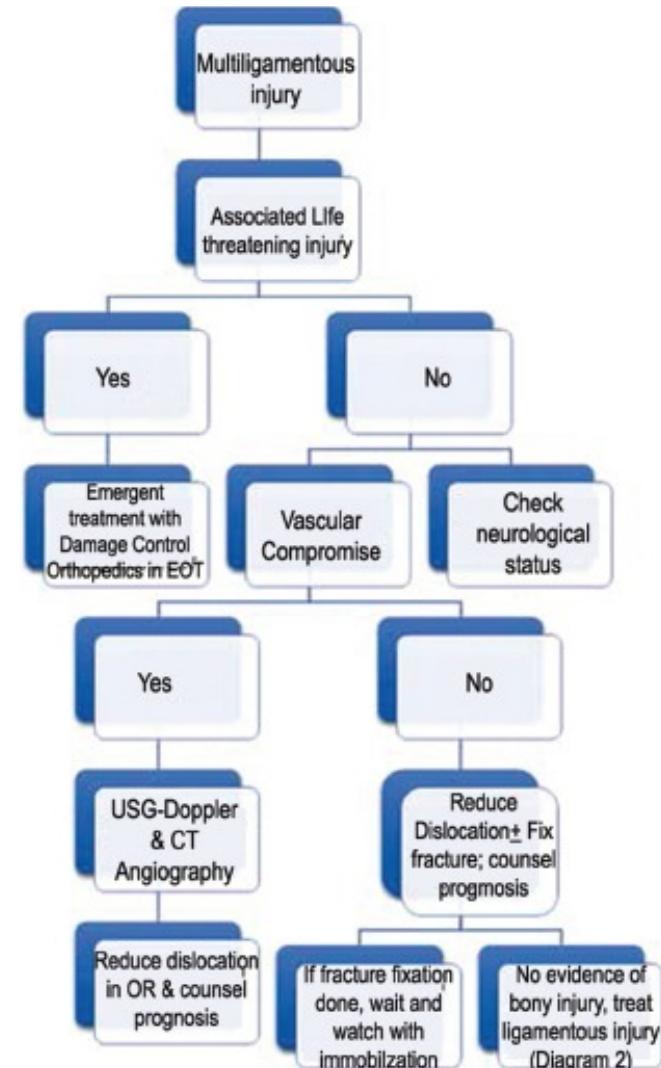
What next?

- External fixator, brace or cast
- Decide treatment options
 - Conservative/Non-operative
 - Operative stabilisation
 - Repair ± Augmentation
 - Reconstruction
 - Timing of operation
 - “Conservative treatment in acute cases”



Urgent surgery

- Open dislocation-17%
- Irreducible dislocation
- Associated n/vascular injury
 - 22% Common Peroneal Nerve
 - 11-64% Vascular Injury
- Compartment syndrome
- Assessment stability



Timing of operative stabilisation

- Emergency surgery
 - Tissue planes disrupted
 - Fluid extravasation > compartment syndrome
- Early/Acute surgery
 - <3-4 weeks
 - Tissue planes still present
 - Potential for repair
 - Historically > arthrofibrosis
- Chronic reconstruction
 - >4 weeks



Literature problems

- Multi-ligament injuries rare
 - 0.072 per 100 patients
- Heterogenous group
 - Many different combinations
- Different energy patterns: high speed vs. high weight
- Different protocols

Knee multi-ligament reconstruction: a historical note on the fundamental landmarks

B. Di Matteo¹ · V. Tarabella¹ · G. Filardo¹ · Patrizia Tomba² · Anna Vigano² · M. Marcacci¹ · S. Zaffagnini¹

Multiple-Ligament Knee Injuries: A Systematic Review of the Timing of Operative Intervention and Postoperative Rehabilitation

By William R. Mook, MD, Mark D. Miller, MD, David R. Diduch, MD, Jay Hertel, PhD, ATC,
Yaw Boachie-Adjei, MD, and Joseph M. Hart, PhD, ATC

- Systematic Review
- 24 retrospective studies, n=396 knee
- Included: Schenck >75%KD IIIM/IIIL/IV
- Categorized:
 - Acute <3 weeks
 - Chronic > 3 weeks
 - Staged = Combination
 - Further mobility acute >30° 1st 3 weeks active or passive, or immobilization > 3 weeks

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TABLE II Outcomes for Each Surgical Timing Group

Timing	N	Anterior Instability	Posterior Instability	Varus Laxity	Valgus Laxity	Average Range of Motion	Flexion Loss ≥10°
Acute	244						
Percentage (95% confidence interval)*		17.4 (12.8 to 23.3)†	15.3 (11.0 to 21.0)	6.7 (3.8 to 11.5)	8.5 (5.1 to 13.7)	124.5°	1.4 (25.1 to 38.0)‡
No. of patients		35 of 201	31 of 202	11 of 165	14 of 165	147	58 of 185
Chronic	106						
Percentage (95% confidence interval)*		7.5 (3.9 to 14.2)	13.2 (8.0 to 21.0)	5.4 (2.3 to 12.1)	4.3 (1.7 to 10.7)	130.5°	8.1 (2.8 to 21.3)
No. of patients		8 of 106	14 of 106	5 of 92	4 of 92	8	3 of 37
Staged	46						
Percentage (95% confidence interval)*		10.9 (4.7 to 23.0)	9.1 (3.1 to 23.6)	3.0 (0.5 to 14.3)	0.0 (0.0 to 10.4)	129.4°	0.0 (0.0 to 17.6)
No. of patients		5 of 46	3 of 33	1 of 33	0 of 33	46	0 of 18

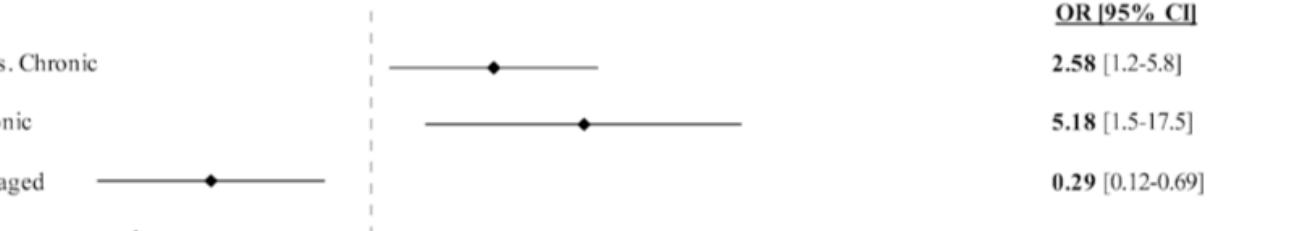
Acute treatment resulted in less residual knee instability compared chronic treatment
OR 2.58 95% CI 1.2 to 5.8, p=0.018

Acute treatment results in more flexion deficits compared to chronic treatment
OR 5.18 95% CI 1.5-17.5, p=0.004

Multiple-Ligament Knee Injuries: A Systematic Review of the Timing of Operative Intervention and Postoperative Rehabilitation

Surgical Timing

Anterior Instability, Acute vs. Chronic



Flexion Loss, Acute vs. Chronic



Subjective E/G, Acute vs. Staged



Subjective E/G,
Chronic vs. Staged



Rehabilitation: Acute Surgery & Immobilization vs. Acute Surgery & Early Mobility

Posterior Instability



Varus Laxity



Valgus Laxity



Flexion Loss $\geq 10^\circ$



Extension Loss $\geq 5^\circ$



Severely Abnormal/Poor Scores



0.01

0.1

1

10

100

1000

Odds Ratio

Early mobility was not associated with increased joint instability.

Acute mobilization yielded fewer ROM deficits, did not reduce future MUA or Arthrolysis

Mook et al. JBJS AM 2009;91:2946-57

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- Concluded
 - Delayed reconstruction could potentially yield equivalent outcomes of stability compared to acute surgery
 - Acute treatment better outcomes early mobility vs. immobilization
 - Acute still results in ROM deficits
 - Staged procedures better subjective outcomes and lower ROM deficits
 - Still require additional treatment for joint stiffness

State of the Art Regarding the Management of Multiligamentous Injuries of the Knee

Nigel T. Mabvuure¹, Marco Malahias², Behrooz Haddad⁴, Sandip Hindocha *³ and Wasim S. Khan⁴

- Levy's paper Arthroscopy 2007
 - Wong KSSTA 2004, Richter AJSM 2002, Rios J Trauma 2003

	Operative	Non-operative
Return to work	72%	52%
Return to sport	29%	10%
ROM	126°	123°
Lysholm	80	57
IKDC	58	20

- Lysholm 65-83 > Poor

The timing of surgical treatment of knee dislocations a systematic review

Wu Jiang · Jianhua Yao · Yuan He · Wei Sun ·
Yan Huang · Dejia Kong

- Systematic Review
- 12 articles
- n=150 (153 knees)
 - KD IIIM n=69
 - KDIIIL n=84
- Excellent/Good 79%
Staged vs. Acute 58.4%
vs. Chronic 45.5%

	Cases	Excellent or good (%)	Fair or poor (%)
Acute	77	45 (58.4)	32 (41.6)
Chronic	33	15 (45.5)	18 (54.5)
Staged	43	34 (79.1)	9 (20.9)
Staged A	34	27 (79.4)	7 (20.6)
Staged B	9	7 (77.8)	2 (22.2)
KD-IIIM	69	46 (66.7)	23 (33.3)
KD-IIIL	84	48 (57.1)	36 (42.9)

Early or delayed reconstruction in multi-ligament knee injuries: A systematic review and meta-analysis

Erik Hohmann ^{a,b,*}, Vaida Glatt ^c, Kevin Tetsworth ^{d,e,f,g}

- 8 studies n=260
- Early (n=149) 10.6 days, late (n=111) 294 days

Characteristics of the included studies.

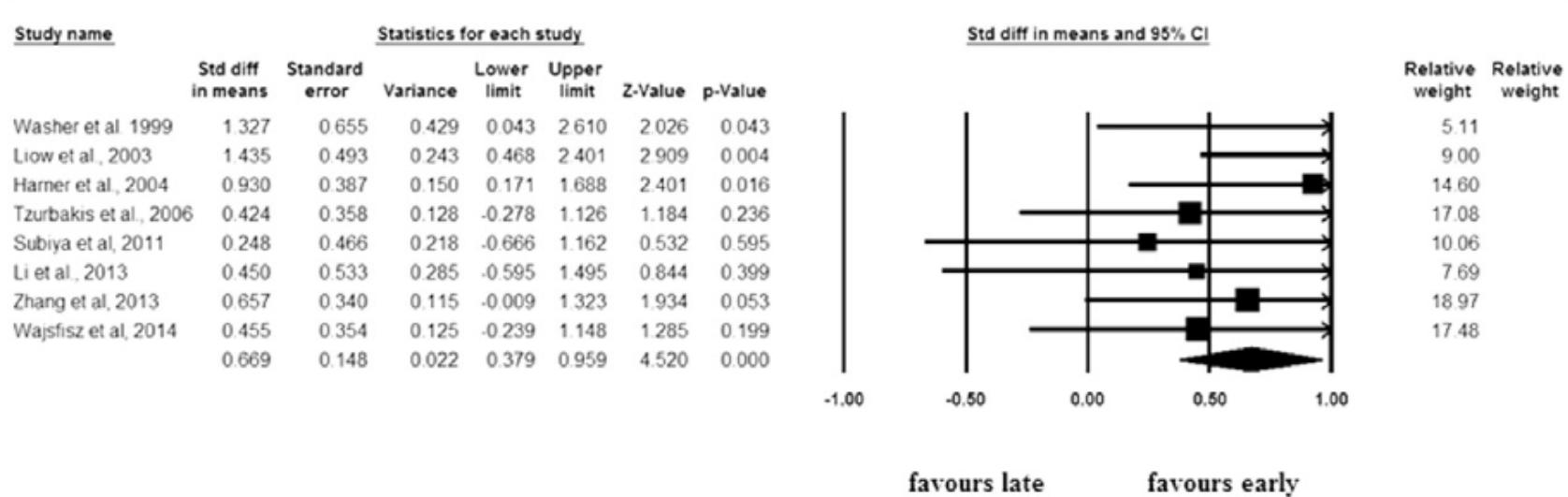
Study	Study design	Sample size	Time to surgery	Mean age (years)	Length of follow-up (months)	Intervention	Outcome
Wascher et al. (1999)	Level IV case series	Acute: 9 Chronic: 4	11 (7–18) 337 (45–517)	26.2 (14–40) 30.5 (20–51)	37.5 (24–50) 40.2 (28–54)	Allograft ACL/PCL	Lysholm 91.8 ROM 2–132 KT 1000 4 mm Lysholm 79.2 ROM 3–126 KT 1000 5.6
Liow et al. (2003)	Level IV case series	Acute: 8 Chronic: 14	10.4 (3–14) 860 (180–1890)	25.4 (16–35) 35 (15–43)	25.1 (8–36) 37.6 (6–84)	ACL/PCL auto/allograft LCL repair PLC repair	Lysholm 87 Tegner 5 ROM 10–136 Lysholm 75 Tegner 4.4 ROM 7–132
Harner et al. (2004)	Level III retrospective cohort study	Acute: 19 Chronic: 12	12 (5–21) 195 (150–630)	28.4 (16–51)	>24	ACL/PCL Allograft LCL allograft MCL repair	Lysholm 91 + 7 (72–100), ROM 1–128 Lysholm 80 + 17 (50–100) ROM 1–129
Tzurbakis et al. (2006)	Level IV retrospective case series	Acute: 38 Chronic: 10	7.5 ± 5.8 204.7 ± 138.1	28.6 + 11.9	51.3 ± 29.9 (24–96)	ACL/PCL autograft PLC/PMC.MCL repair/recon LCL repair/recon	Lysholm 87 ± 12.3 Tegner 4.4 ± 2.1 ROM 2–132 Lysholm 81.7 ± 13.3 Tegner 5.2 ± 2.2 ROM 1–134
Subiya et al. (2011)	Level IV case series	Acute: 11	5.4 (1–14)	36 (14–33)	23.6 (530)	ACL/PCL autograft	Lysholm 93.3 (81–100)
Li et al. (2013)	Level IV retrospective case series	Chronic: 8 Acute: 6 Chronic: 9	126 (30–540)	19.6 (14–33) 37.7 (26–48) 36.4 (28–47)	90 (72–144)	ACL/PCL ITB autograft PMC/MCL repair	Lysholm 90 (82–100) Lysholm 87.5 (81–95) Tegner 3.9 + 0.6 ROM 3–132 Lysholm 82.1 (74–92) Tegner 3.4–0.5 2–119
Zhang (2013)	Level IV retrospective case	Acute: 48 Chronic: 11	7.3 (1–13) 114 (30–270)	43.7 (21–63)	30	ACL/PCL Allograft MCL/LCL repair/recon	Lysholm 87.6 + 10.2 Lysholm 80.5 + 13.3
Wajsifz et al. (2014)	Level IV retrospective multicentre case series	Acute: 10 Chronic: 43	<21 days 222 (21–56,100)		49 (12–146)	ACL/PCL Autograft PLC repair/recon	Lysholm 81.4 (62.1–100) Lysholm 76.5 (37–100)

Early or delayed reconstruction in multi-ligament knee injuries: A systematic review and meta-analysis

Erik Hohmann ^{a,b,*}, Vaida Glatt ^c, Kevin Tetsworth ^{d,e,f,g}

- Early higher Lysholm score
- SMD 0.669, 95% CI 0.379 to 0.959, $I_2 = 0\%$, $p < 0.0001$

Meta Analysis

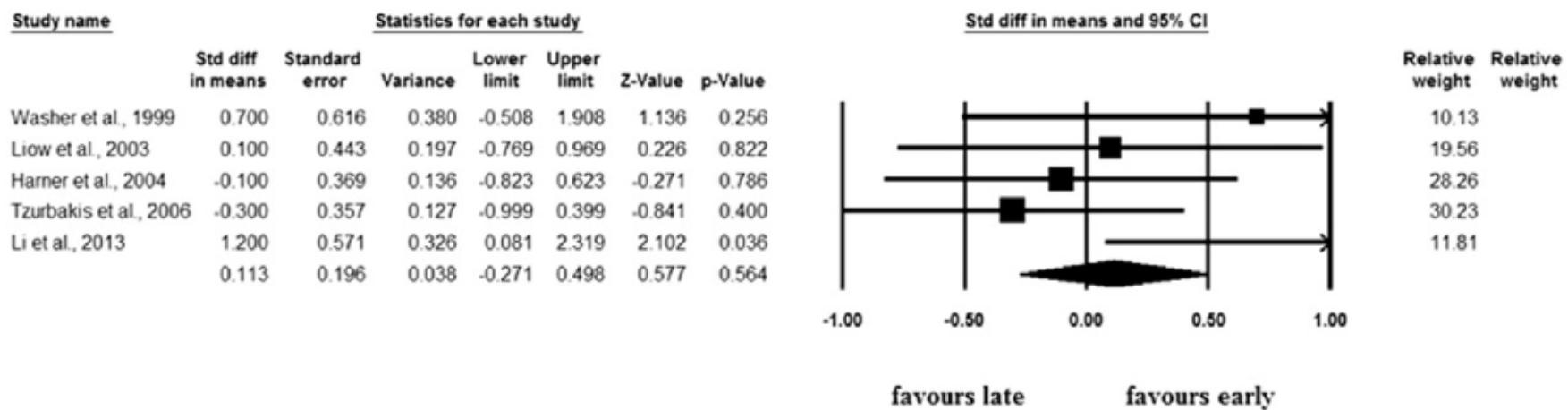


Early or delayed reconstruction in multi-ligament knee injuries: A systematic review and meta-analysis

Erik Hohmann ^{a,b,*}, Vaida Glatt ^c, Kevin Tetsworth ^{d,e,f,g}

- No difference in Range of Motion
- SMD 0.113, 95%CI -0.271 to 0.498, $I_2=35.5\%$, $p=0.564$

Meta Analysis



Practice Guidelines for the management of multi-ligamentous injuries of the knee.

Goyal et al. Indian J Orthop 2017

- Systematic Review
- 521 articles, 38 papers
- Looking at:
 - Early vs. delayed
 - Repair with treatment
 - Operative vs. non-operative

Study	Year	Design
Wascher <i>et al.</i> ⁴⁸	1999	Prospective cohort
Bernstein ⁵⁰	2011	Systematic review
Dwyer <i>et al.</i> ⁴⁹	2012	Review article
Meuffels <i>et al.</i> ⁵¹	2012	Systematic review
Burrus <i>et al.</i> ⁵	2016	Systematic review

Study	Year	Design	Level of evidence
Mariani <i>et al.</i> ⁵³	1999	Retrospective cohort	III
Stannard <i>et al.</i> ⁵²	2005	Prospective cohort	II
Levy <i>et al.</i> ⁵⁵	2010	Prospective cohort	III
Peskun <i>et al.</i> ¹⁵	2010	Meta-analysis	I
Black and Stannard <i>et al.</i> ⁵⁶	2015	Review article	I
Dwyer <i>et al.</i> ⁴⁹	2012	Review article	II

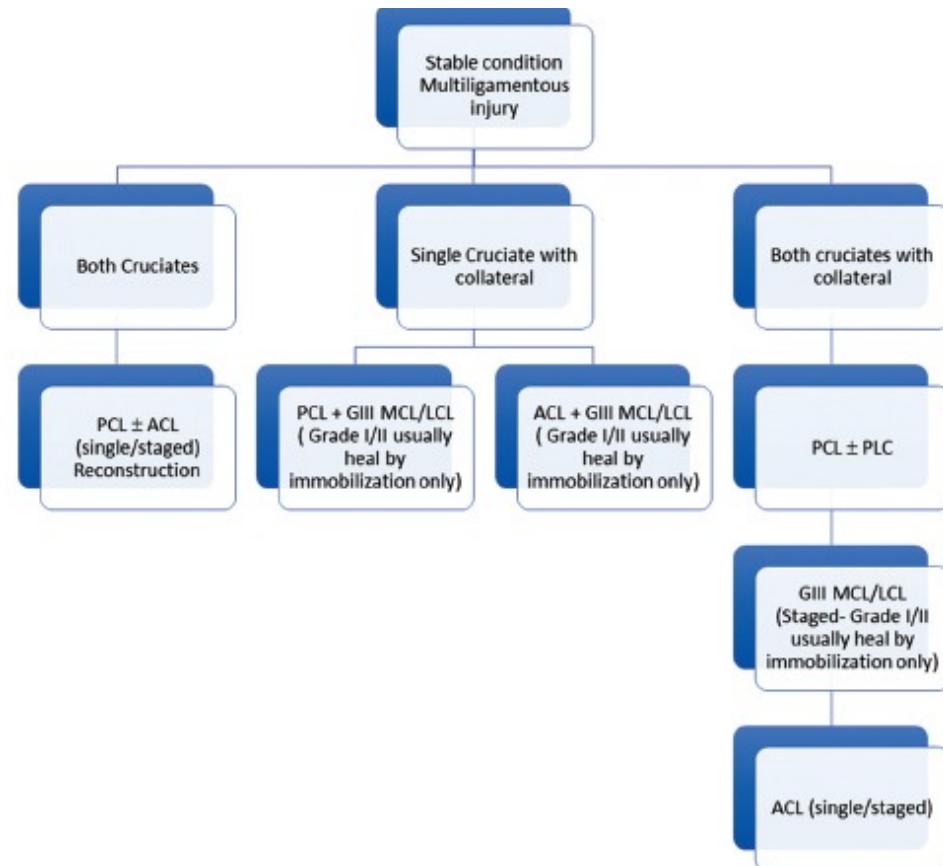
Authors	Lysholm score	Tegner scale	IKDC	ROM	RTE	RTS
Richter ¹⁰	64.8	2.7	NR	NR	53%	17%
Ríos <i>et al.</i> ³²	NA	NR	NR	NR	NR	NR
Wong <i>et al.</i> ³³	NR	NR	63.7	136.8	NR	NR
Dedmond and Almekinders ³⁴	82.5	NR	NR	123	Same as conservative	Same as conservative

ROM=Range of motion, IKDC=International Knee Documentation Committee, RTS=Return to sport, RTE=Return to employment,
NA=Not available. NR=Not Reported.

Practice Guidelines for the management of multi-ligamentous injuries of the knee.

Goyal et al. Indian J Orthop 2017

- Conclusions
- Inclination towards early staged/single procedure
- MCL better results with non-operative and recon other injuries



Take Home Messages

- Limited evidence
- Conservative acute treatment option <3 weeks
 - Avoid the inflammatory phase
- Then augmented repair & staged

State of the Art Regarding the Management of Multiligamentous Injuries of the Knee

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Poly-traumatic multi-ligament knee injuries: is the knee the limiting factor?

Jarret M. Woodmass¹ · Nick R. Johnson¹ · Rohith Mohan¹ · Aaron J. Krych¹ · Bruce A. Levy¹ · Michael J. Stuart¹

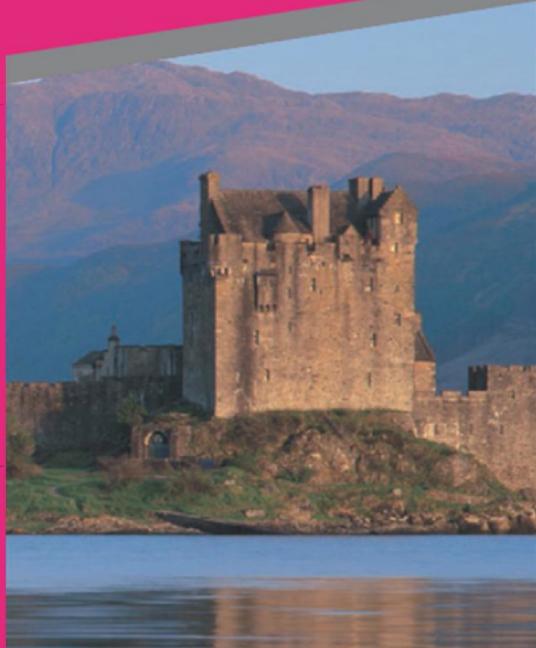
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Fatigué, mais merci de votre attention