

Advanced knee course, Val d'Isère, 01-2016

Revision ACL reconstruction: place for extraarticular procedures.

Prof. Romain Seil

Orthopaedic
Surgery



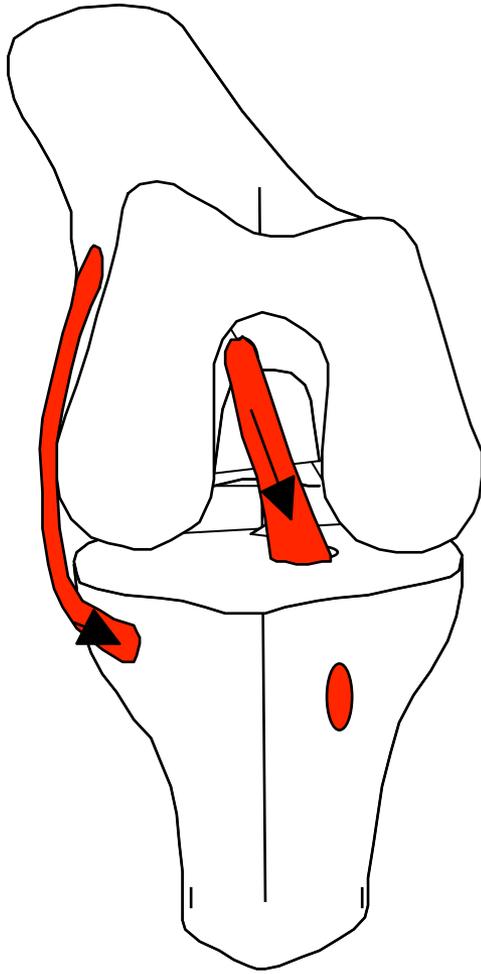
Centre Hospitalier
de Luxembourg

Sports Medicine
Research Laboratory



Luxembourg
Institute of Health

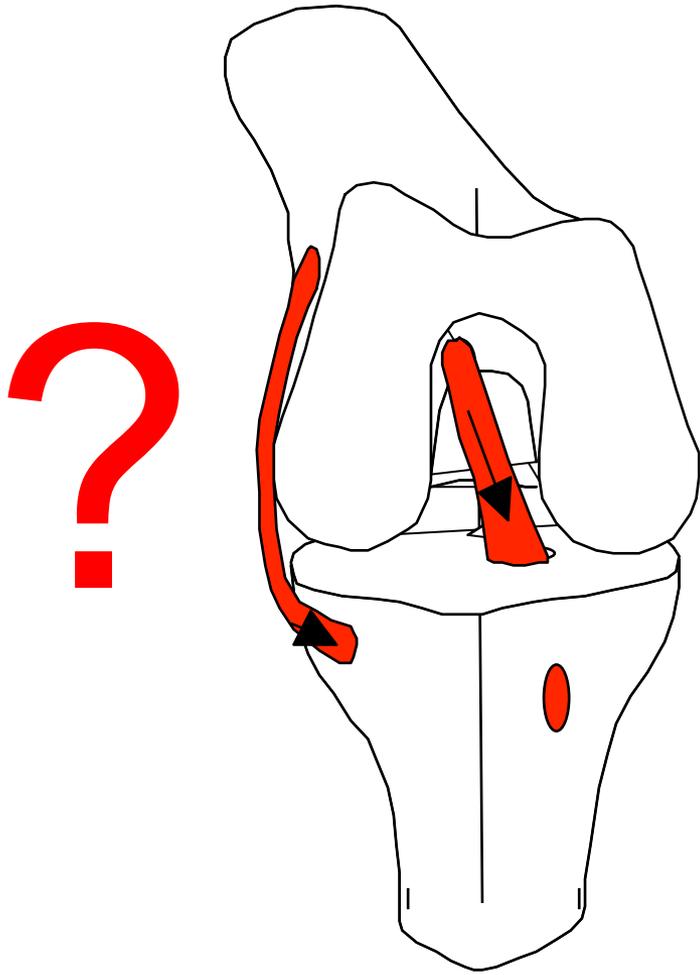
Revision ACL reconstructions & EAP



Lateral tibiofemoral tenodesis or graft

- ❖ Little evidence in the literature (especially for revision ACL-reconstructions):
- ❖ Few studies
- ❖ No clear indications
- ❖ No international consensus

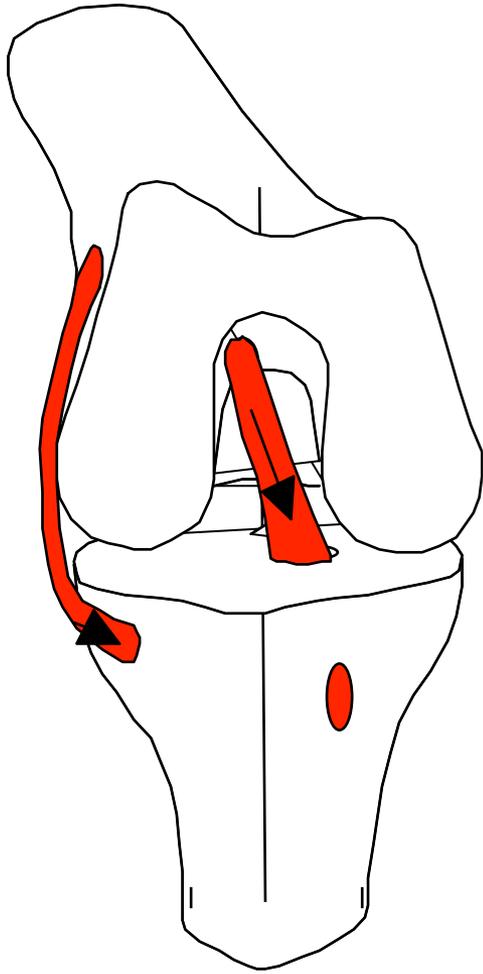
Revision ACL reconstructions & EAP



Lateral tibiofemoral tenodesis or graft

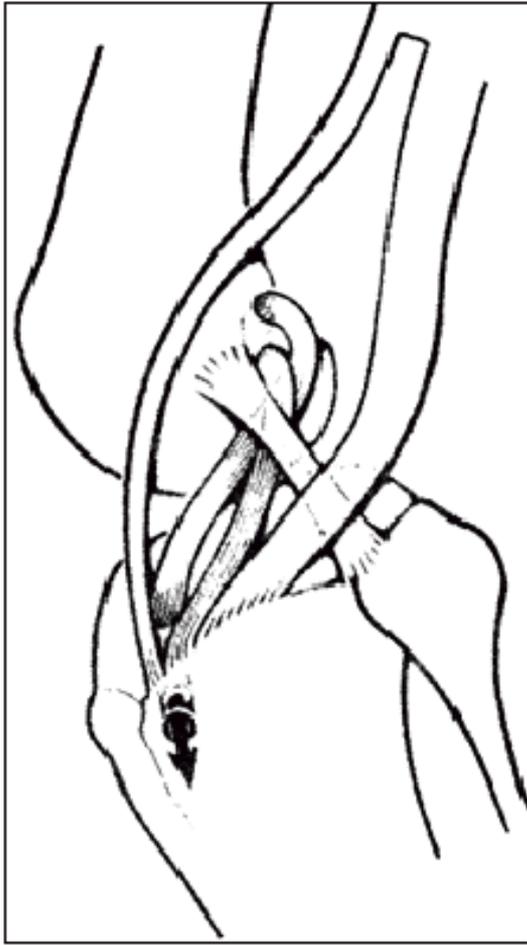
- ❖ Type of technique ?
- ❖ Short-term morbidity ?
- ❖ Decrease pivot shift rate ?
- ❖ Decrease rerupture rate ?
- ❖ Lateral compartment overload ?
- ❖ Tibiofemoral OA ?
- ❖ Patellofemoral OA (use of ITB) ?

Biomechanical principle



Goal:

1. Reduce anterior drawer of lateral tibia plateau and hence pivot shift
2. Limit internal rotation of the tibia (protection of ACL reconstruction)



Lemaire extraarticular tenodesis

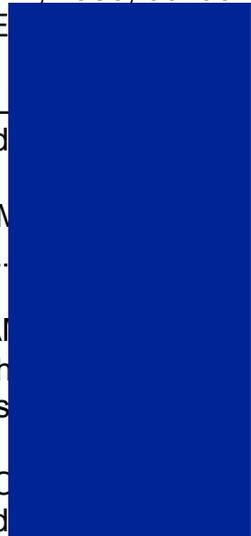
- ❖ Fascia lata strip
- ❖ Pediculated distally (Gerdy's tubercle)
- ❖ Into femoral tunnel proximally
- ❖ Sutured back to itself
- ❖ Underneath LCL (DD ALL reconstruction)

LEMAIRE M. Rupture ancienne du ligament croisé antérieur du genou. *J. Chir. (Paris)*, 1967, 93 : 311-320.

LEMAIRE M., COMBELLE F. Technique actuelle de plastie ligamentaire pour rupture ancienne du ligament croisé antérieur. *Rev. Chir. Orthop.*, 1980, 66: 523 - 525.

1980's & 90's: high number of studies for primary ACL-R & EAP

- ❖ AIT SI SELMI T. Résultats éloignés de la greffe libre du ligament croisé antérieur associée à une plastie extra-articulaire. Thèse Med. Lyon, **1995**.
- ❖ CHASSAING V. La ligamentoplastie palliative (technique de LEMAIRE) pour rupture du ligament croisé antérieur. Rev. Chir. Orthop., Suppl. II, **1980**, 66: 93 - 96.
- ❖ DRAGANISH L. F., HSIEH Y., REIDER B., LEMMAIRE M. The effect of an extra-articular procedure on allograft reconstructions for chronic ruptures of the anterior cruciate ligament. Am. J. Sports Med., **1995**, 23 : 186 - 195.
- ❖ DRAGANISH L. F., REIDER B., LEMMAIRE M. The effect of an extra-articular procedure on allograft reconstructions for chronic ruptures of the anterior cruciate ligament. Am. J. Sports Med., **1995**, 23 : 186 - 195.
- ❖ ENGBRETSSEN L., LEW W. D., YAMAMOTO T. The effect of an extra-articular procedure on allograft reconstructions for chronic ruptures of the anterior cruciate ligament. Am. J. Sports Med., **1995**, 23 : 186 - 195.
- ❖ KRACKOW K. A., BROOKS R. L., YAMAMOTO T. The effect of an extra-articular procedure on allograft reconstructions for chronic ruptures of the anterior cruciate ligament. Am. J. Sports Med., **1983**, 293 - 302.
- ❖ KUROSAWA H., YASUDA K., YAMAMOTO T. The effect of an extra-articular procedure on allograft reconstructions for chronic ruptures of the anterior cruciate ligament. Am. J. Sports Med., **1995**, 23 : 186 - 195.
- ❖ LEMAIRE M. Résultats de la plastie extra-articulaire de Lemaire pour rupture du ligament croisé antérieur. Rev. Chir. Orthop., **1983**, 69 : 278-282.
- ❖ NEYRET Ph., PALOMO J. R., DOUGLASS J. R. The effect of an extra-articular procedure on allograft reconstructions for chronic ruptures of the anterior cruciate ligament. Br. J. Sports Med., **1995**, 29 : 384 - 388.
- ❖ NOYES F. R., BARBER S. D. The effect of an extra-articular procedure on allograft reconstructions for chronic ruptures of the anterior cruciate ligament. J. Bone Joint Surg., **1991**, 73-A : 882 - 892.
- ❖ O'BRIEN S. J., WARREN R. F., WICKIEWICZ T. L., RAWLINS B. A., ALLEN A. A., PANARIELLO R., NEYRET Ph. The effect of an extra-articular procedure on allograft reconstructions for chronic ruptures of the anterior cruciate ligament. Am. J. Sports Med., **1995**, 23 : 186 - 195.
- ❖ SAILLANT G., BOUCHET Th., SALGADO V., BENALET JP., ROY CAMILLE R. Cure chirurgicale des lésions du ligament croisé antérieur du genou par plastie extra-articulaire de Lemaire. Résultats à propos de 132 cas. J. Traumatol. Sports, **1990**, 3 : 67 - 72.



Intérêt d'une plastie extra-articulaire dans le traitement des laxités antérieures chroniques du genou par une autogreffe de tendon rotulien

Étude prospective randomisée d'une série de 100 cas avec 5 ans de recul

Patellar tendon-bone autograft reconstruction of the anterior cruciate ligament for advanced-stage chronic anterior laxity: is an extra-articular plasty necessary? A prospective randomized study of 100 patients with five year follow-up

Y. Acquitter, C. Hulet, B. Locker, J.-C. Delbarre, S. Jambou, C. Vielpeau

Département de Chirurgie Orthopédique et de Traumatologie, CHU de Caen, avenue Côte de Nacre, 14033 Caen Cedex.

Randomized controlled trial

- ❖ N = 100
- ❖ BPTB & quadriceps strip or BPTB alone
- ❖ « Big laxities »
- ❖ Lachman & Pivot shift +++
- ❖ > 5 mm SSD Man Max KT 1000
- ❖ 58 months FU
- ❖ No difference between groups

Acquitter Y, RCOT 2003



Indication

Primary surgery

Intraarticular: 163

Intra- & EAP: 26

n=189

Participating centres: Bordeaux, Brest, Caen, Lyon, Nice, Paris, Versailles, Toulouse

Revision ACL reconstruction: influence of a lateral tenodesis

Christophe Trojani · Philippe Beaufile · Gilles Burdin · Christophe Bussière ·
Vincent Chassaing · Patrick Djian · Frédéric Dubrana · François-Paul Ehkirch ·
Jean-Pierre Franceschi · Christophe Hulet · Franck Jouve · Jean-François Potel ·
Abderahmane Sbihi · Philippe Neyret · Philippe Colombet

Retrospective, comparative multicenter study

- ❖ N = 163; min 2 y FU
- ❖ 2 groups: ACL-RR & EAP (51%); ACL-RR (49%)
- ❖ Various graft types for ACL-RR
- ❖ Various extraarticular procedures
- ❖ Failure rate: 15 % ACL-RR
7 % ACL-RR & EAP n.s.

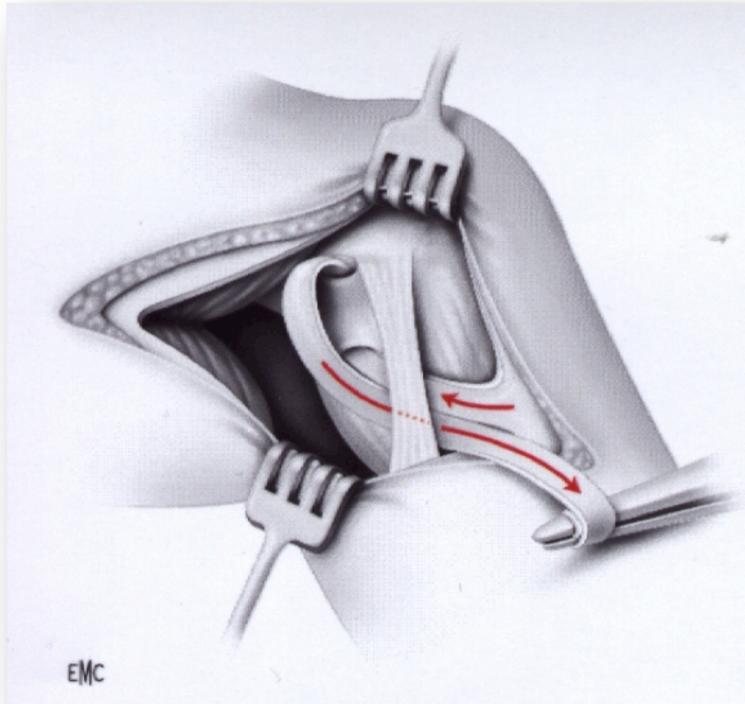
Trojani C, KSSTA 2012

Revision ACL reconstruction: influence of a lateral tenodesis

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Type of surgery (<i>n</i> = 163)	Intra- + extra- articular graft (%) <i>n</i> = 84	Intra-articular graft (%) <i>n</i> = 79	<i>P</i>
Negative pivot shift	80	63	0.03
IKDC A	25	27	n.s.
IKDC B	48	45	n.s.

Isolated Lemaire

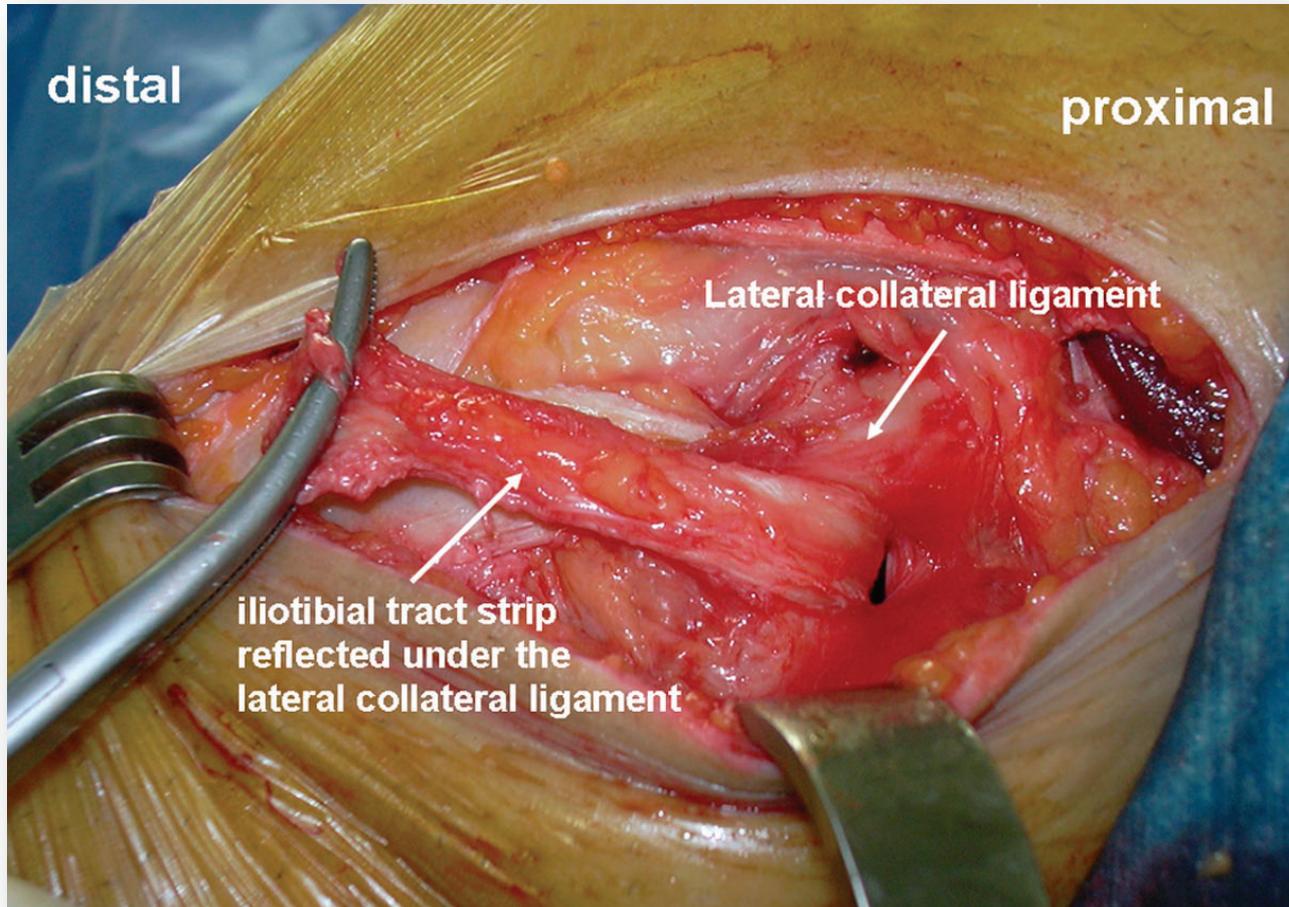


- ❖ 6 patients
- ❖ No subjective instability
- ❖ No pivot shift
- ❖ Delayed Lachman
- ❖ IKDC :
 - 2 B
 - 4 C
- ❖ Telos: > 7 mm SSD

Revision Anterior Cruciate Ligament Reconstruction with Doubled Semitendinosus and Gracilis Tendons and Lateral Extra-Articular Reconstruction

Surgical Technique

By Andrea Ferretti, MD, Fabio Conteduca, MD, Edoardo Monaco, MD, Angelo De Carli, MD, and Carmelo D'Arrigo, MD



Ferretti A, JBJS-A 2007

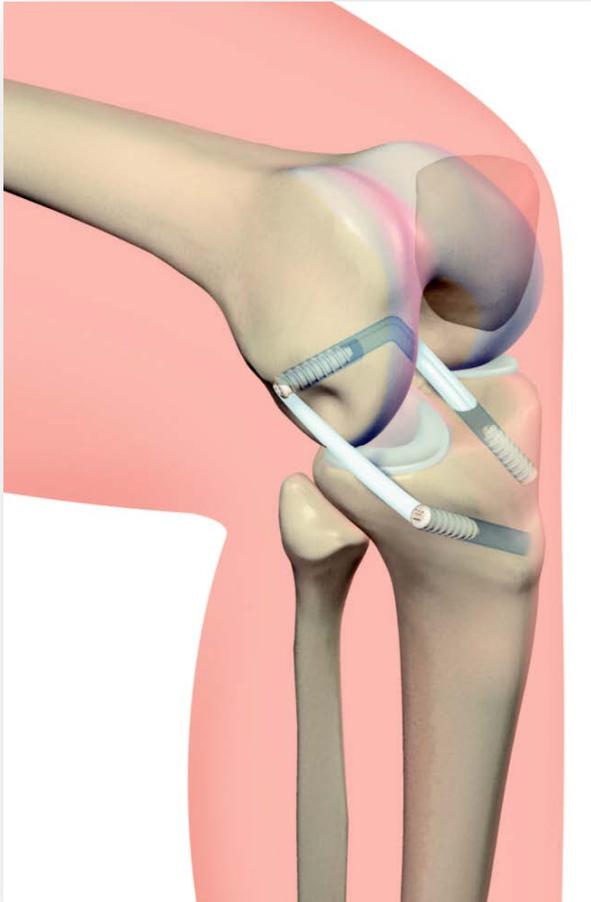
REVISION ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION WITH DOUBLED SEMITENDINOSUS AND GRACILIS TENDONS AND LATERAL EXTRA-ARTICULAR RECONSTRUCTION

BY ANDREA FERRETTI, MD, FABIO CONTEDEUCA, MD, EDOARDO MONACO, MD,
ANGELO DE CARLI, MD, AND CARMELO D'ARRIGO, MD

Outcome

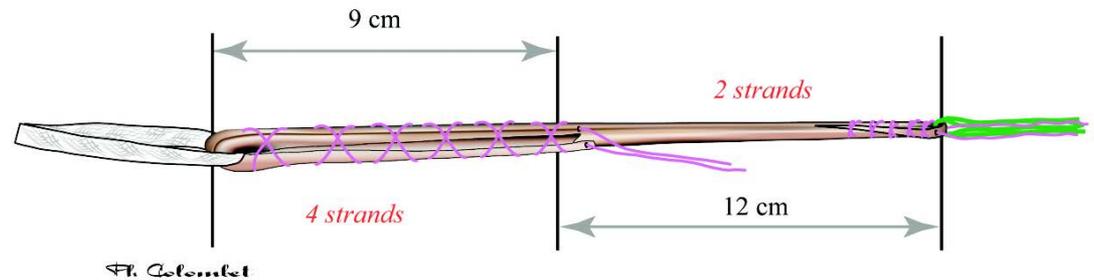
- ❖ N = 28; av. 5 y FU
- ❖ Doubled STG graft & EAP
- ❖ IKDC 84 +/- 12; Lysholm 90 +/- 10 pts.
- ❖ KT 1000 man. max. SSD:
 - < 3 mm: 20 patients
 - 3-5 mm: 6
 - 5 mm: 2
- ❖ Pivot shift:
 - 15 x normal (53%)
 - 7 x (1+)
 - 2 x ($\geq 2+$)
- ❖ 1 re-tear
- ❖ → 10 % failures

Ferretti A, JBJS-A 2006

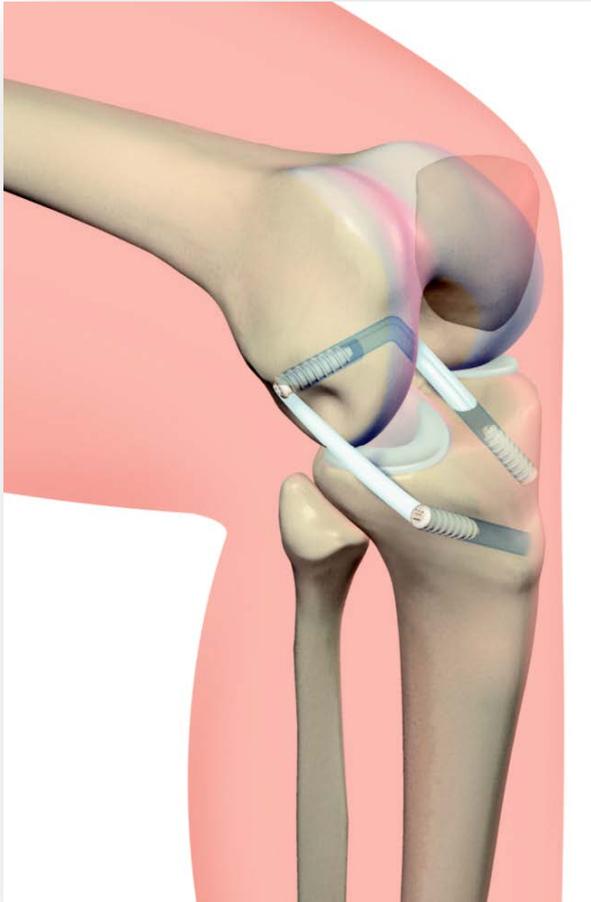


Intra- & extraarticular frame

Setting 4 + 2

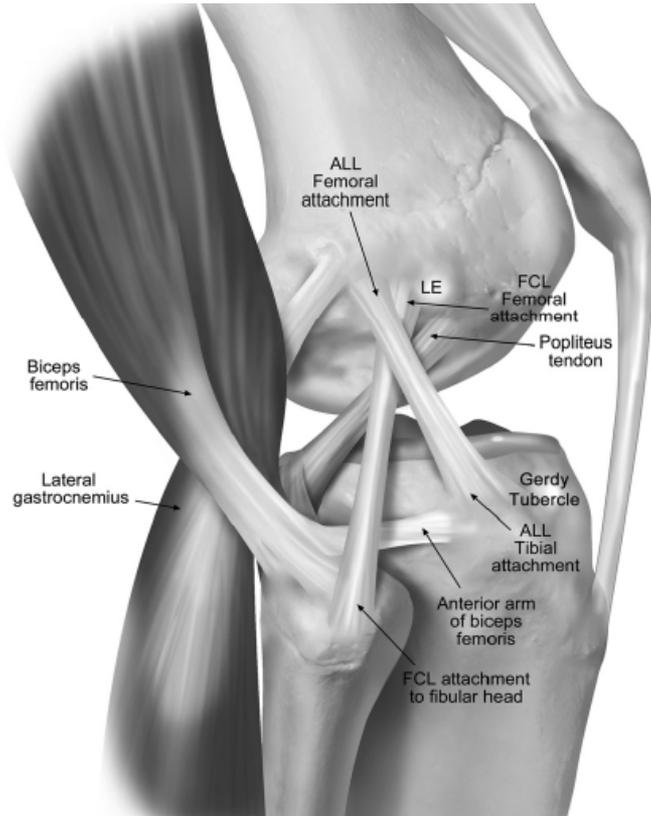


- ❖ 20 revision ACL-R
- ❖ Rotational & sagittal laxity control with navigation
- ❖ Group 1: IA fixation first
- ❖ Group 2: LT fixation first



Intra- & extraarticular frame

- ❖ Addition of EAP to single-bundle ACL-RR: no significant effect on anterior tibial translation and improved the internal tibial rotation control only at 90° of flexion.
- ❖ Load sharing of clinical interest in difficult cases such as ACL revision surgery, evolved laxities, and patients doing at-risk sports (eg, high-energy pivot contact competitors).



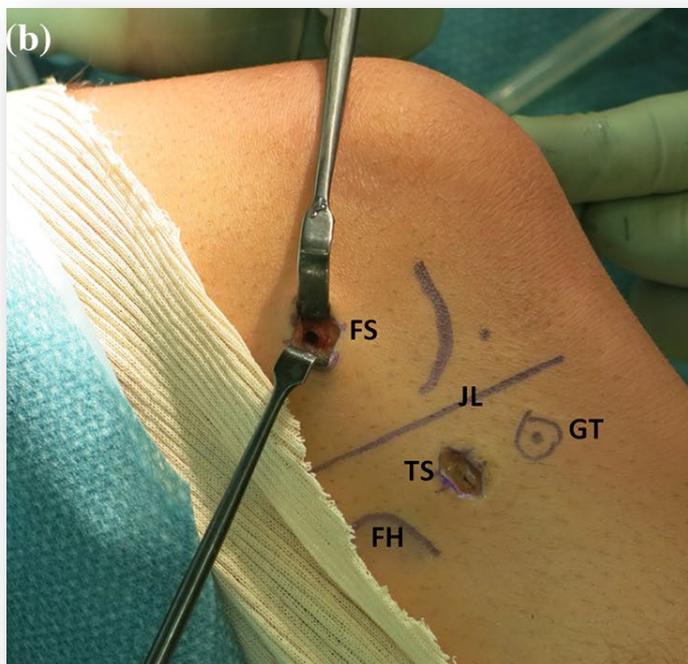
- ❖ In the 'post-ALL era' extraarticular procedures regain momentum !

Mitchell I. Kennedy,* Steven Claes,z§ MD, PhD, Fernando Augusto Freitas Fuso,* MD, Brady T. Williams,* BS, Mary T. Goldsmith,* MSc, Travis Lee Turnbull,* PhD, Coen A. Wijdicks,* PhD, and Robert F. LaPrade,*y|| MD, PhD

Claes S, *J Anat* 2013

Combined anterolateral ligament and anatomic anterior cruciate ligament reconstruction of the knee

James O. Smith^{1,2} · Sam K. Yasen^{1,2} · Breck Lord^{1,2} · Adrian J. Wilson^{1,2}



- ❖ In the post-ALL era extraarticular procedures regain momentum !
- ❖ All on primary ACL's

Smith JO, Wilson A, KSSTA 2015

There is no such thing like a single ACL injury: Profiles of ACL-injured patients

R. Seil^{a,b,c,*}, C. Mouton^{b,c}, A. Lion^{b,c}, C. Nührenböcker^a, D. Pape^{a,b,c}, D. Theisen^{b,c}

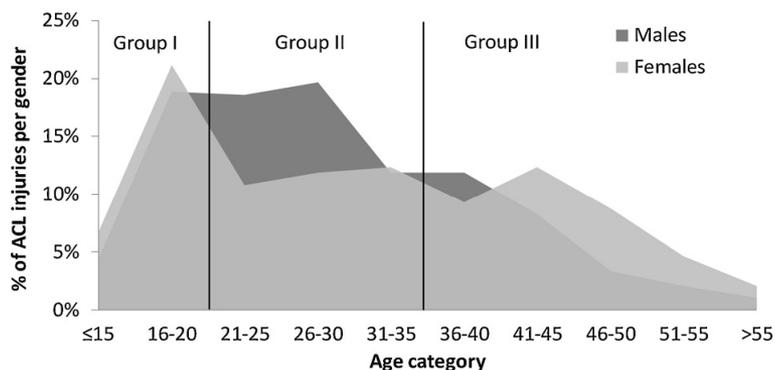
^a Sports Clinic, clinique d'Eich, Academic Teaching Hospital of the Saarland University Medical Centre, centre hospitalier de Luxembourg, 76, rue d'Eich, 1460 Luxembourg, Luxembourg

^b Sports Medicine Research Laboratory, Luxembourg Institute of Health, 76, rue d'Eich, 1460 Luxembourg, Luxembourg

^c Cartilage Net of the Greater Region Saar-Lor-Lux, Luxembourg, Luxembourg

Better differentiation of ACL injured patients is essential

Age & gender

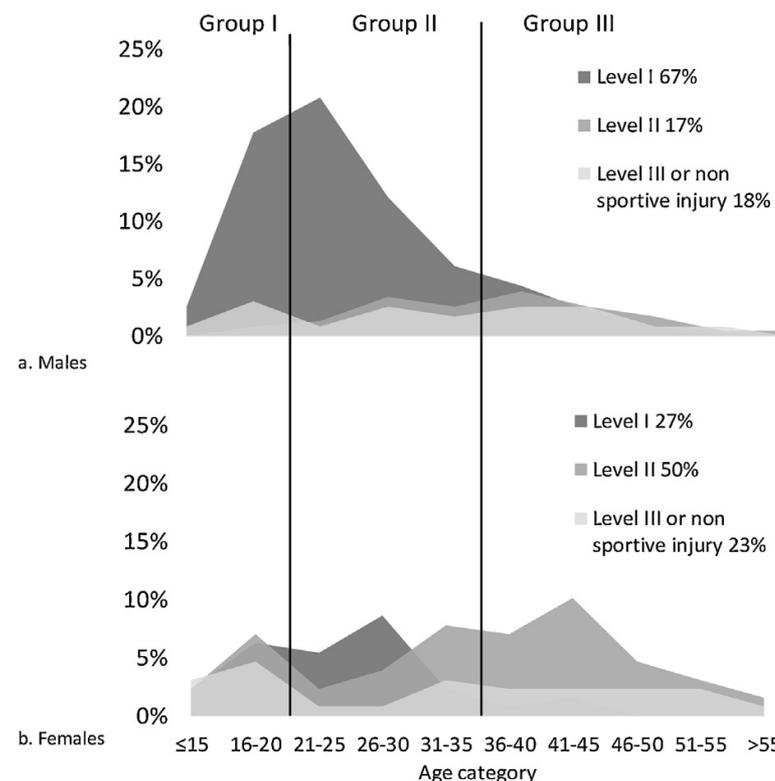


Distribution of ACL injuries per identified age groups and gender.

	Age group		
	I	II	III
	≤ 20 years	21–35 years	≥ 36 years
Males	51 (23%)	112 (50%)	59 (27%)
Females	35 (28%)	43 (35%) ^a	46 (37%) ^a

^a Proportion of females significantly different than proportion of males for this age group; $P < 0.01$.

Activity profile



Seil R, OTSR 2016

Better differentiation of ACL injured patients is essential

Noninjured Knees of Patients With Noncontact ACL Injuries Display Higher Average Anterior and Internal Rotational Knee Laxity Compared With Healthy Knees of a Noninjured Population

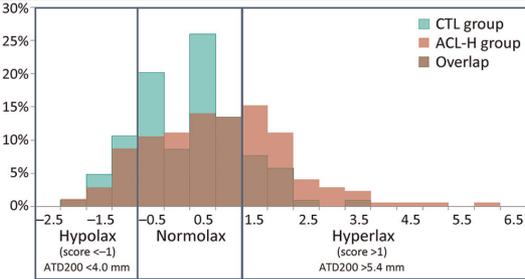
Caroline Mouton,* MSc, Daniel Theisen,* PT, PhD, Tim Meyer,† MD, PhD, H el ene Agostinis,* MSc, Christian N uhrenb orger,‡ MD, Dietrich Pape,** MD, PhD, and Romain Seil,**§ MD, PhD
Investigation performed at Centre Hospitalier de Luxembourg–Clinique d’Eich, Luxembourg

Knee Surg Sports Traumatol Arthrosc
DOI 10.1007/s00167-014-3244-6

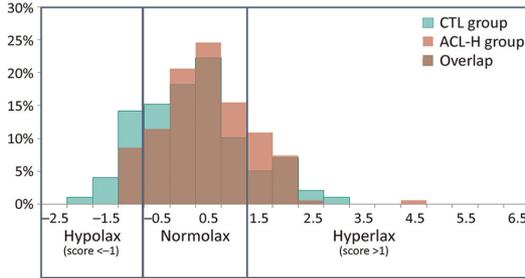
KNEE

Combined anterior and rotational laxity measurements allow characterizing personal knee laxity profiles in healthy individuals

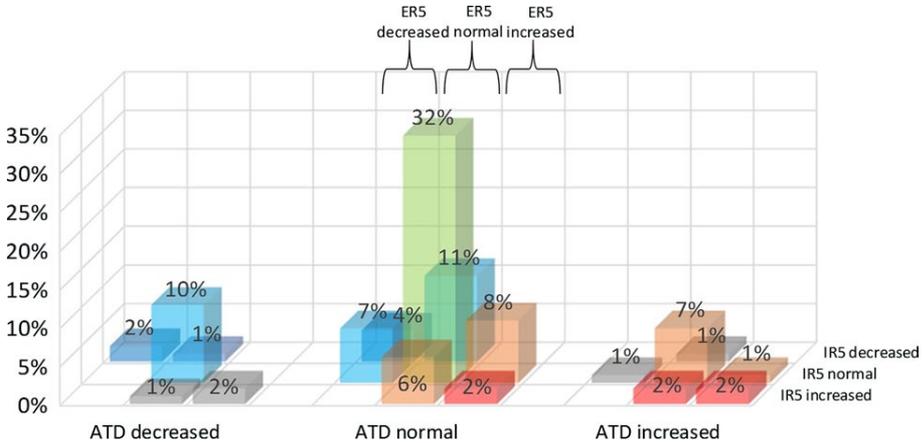
Caroline Mouton · Romain Seil · Tim Meyer · H el ene Agostinis · Daniel Theisen



CTL: 16% 68% 16% } $P < .01$
ACL-H: 13% 49% 38%



CTL: 19% 66% 15% } $P = .04$
ACL-H: 9% 72% 19%



Seil R, OTSR 2016

3 categories of ACL revision patients

- 60 %** ✧ Similar to primary ACL-R
(correct anatomic position, good quality bone, limited associated injuries)

- 30 %** ✧ More limited but still encouraging
(complex multiligament instabilities, major cartilage lesions, limited quality bone stock, long standing symptoms of instability and pain)

- 10 %** ✧ Salvage procedure, limited-goal surgery
(associated osteotomies or meniscus transplantations may be required)

*Feucht MJ, KSSTA 2014
Shelbourne KD, AJSM 2014
Sonnery-Cottet B, AJSM 2014*

EAP in ACL revisions

- ✧ Little science
- ✧ EA tenodesis has an effect on pivot shift control
- ✧ No effect on AP translation
- ✧ Effect on internal rotation at 90° of flexion
- ✧ Effect on ACL protection ?
- ✧ Side effects ?
- ✧ Tenodesis or ALL reconstructions ?
- ✧ Better differentiation of patients with ACL reinjuries !



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