

Accelerated return to sport after anterior cruciate ligament reconstruction and early knee osteoarthritis features at one year

CULVENOR AG, PATTERSON BE, GUERMAZI A, MORRIS HG, WHITEHEAD TS, CROSSLEY KM







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Accelerated return to sport after ACL reconstruction and early knee osteoarthritis features at 1 year: an exploratory study

Adam G. Culvenor, PT, PhD, Brooke E. Patterson, PT, Ali Guermazi, MD, PhD, Hayden G. Morris, MD, Timothy S. Whitehead, MD, Kay M. Crossley, PT, PhD



PM&R: Journal of injury, function and rehabilitation

Dr Adam Culvenor 2 @agculvenor NHMRC Early Career Fellow (Austria / La Trobe)





ACL injury and reconstruction







Osteophytes & JSN



Osteophytes & JSN

Return to Sport after ACL reconstruction



Fifty-five per cent return to competitive sport following anterior cruciate ligament reconstruction surgery: an updated systematic review and meta-analysis including aspects of physical functioning and contextual factors

Clare L Ardern, Nicholas F Taylor, Julian A Feller and Kate E Webster

Br J Sports Med 2014 48: 1543-1552 originally published online August 25, 2014 doi: 10.1136/bjsports-2013-093398

55% of people return to competitive sport following ACLR 65% of people return to pre-injury level of sport 81% of people return to any kind of sport



Eighty-three per cent of elite athletes return to preinjury sport after anterior cruciate ligament reconstruction: a systematic review with meta-analysis of return to sport rates. graft rupture rates and performance outcomes Courtney C H Lai, Clare L Ardern, Julian A Feller and Kate E Webster

Br J Sports Med published online February 21, 2017

83% of elite athletes return to pre-injury sport following ACLR Time to return to sport: < 12 months (only 2/15 > 12 months)

- Time to RTS varies (unrelated to type and severity of injury)
- RTS decisions should include information from a battery of tests (including decision making)
- Workload should be considered in RTS decisions
- Psychological factors should be considered
- Consensus on RTS criteria are needed



2016 Consensus statement on return to sport from the First World Congress in Sports Physical Therapy, Bern

Clare L Ardern, Philip Glasgow, Anthony Schneiders, Erik Witvrouw, Benjamin Clarsen, Ann Cools, Boris Gojanovic, Steffan Griffin, Karim M Khan, Håvard Moksnes, Stephen A Mutch, Nicola Phillips, Gustaaf Reurink, Robin Sadler, Karin Grävare Silbernagel, Kristian Thorborg, Arnlaug Wangensteen, Kevin E Wilk and Mario Bizzini

Br J Sports Med 2016 50: 853-864 originally published online May 25, 2016 doi: 10.1136/bjsports-2016-096278

Return to Sport after ACL injury

Optimal timing for RTS????



Simple decision rules can reduce reinjury risk by 84% after ACL reconstruction: the Delaware-Oslo ACL cohort study

Hege Grindem, Lynn Snyder-Mackler, Håvard Moksnes, Lars Engebretsen and May Arna Risberg

Br J Sports Med published online May 9, 2016



What are the findings?

In the first 2 years after ACL reconstruction, 30% of people who returned to level I sports sustained a reinjury compared with 8% of those who participated in lower level sports.

More symmetrical quadriceps strength prior to return to sport significantly reduced the knee reinjury rate. Return to Sport after ACL injury

Functional capacity and RTS????



Likelihood of ACL graft rupture: not meeting six clinical discharge criteria before return to sport is associated with a four times greater risk of rupture

73% of total participants (n=158) met discharge criteria

Polyvios Kyritsis, Roald Bahr, Philippe Landreau, Riadh Miladi and Erik Witvrouw

Br J Sports Med published online May 23, 2016

Those who did meet discharge criteria, but returned to sport.... 4 X greater risk of graft rupture

Table 1	Discharge tests and criteria used during the study period		
Six-part re	turn to sport tests	Discharge permitted when each of these criteria was met	
Isokinetic test at 60, 180 and 300°/s		Quadriceps deficit <10% at 60°/s	
Single hop		Limb symmetry index >90%	
Triple hop		Limb symmetry index >90%	
Triple crossover hop		Limb symmetry index >90%	
On-field sports-specific rehabilitation		Fully completed	
Running t test		<11 s	

ACL injury and reconstruction



Functional capacity important (quadriceps strength, hop tests, sports specific tests)

Knee osteoarthritis after ACL injury



ACL injury and reconstruction



Knee osteoarthritis after ACL injury

At 6 months post ACLR.....

Cartilage thickness or volume not different to controls **BUT.....**

Cartilage had low *in vivo* resilience (slower recovery from impact loading)

Additionally,

early postoperative sports participation (< 5months) ~ increased cartilage volume, thickness, deformation and slower recovery of cartilage morphological characteristics after running.



And functional capacity.....

Poor functional capacity predicts worse PRO at 2 and 5 years post ACL injury Ericsson, BJSM 2013

Poorer performance on the 1-leg-rise test at one year predicted worse KOOS-QOL at 3-years post ACLR

Culvenor, ACR 2016



Accelerated return to sport after anterior cruciate ligament injury: a risk factor for early knee osteoarthritis?

Adam G Culvenor and Kay M Crossley

Br J Sports Med 2016 50: 260-261 originally published online November 25, 2015

Knee osteoarthritis after ACL injury









AIMS

Exploratory study

To determine if accelerated return to sport (< 10 months) was associated with early knee OA features on MRI at 1 year post ACLR.

Sensitivity analysis:

- 1. Type of ACL injury (isolated and combined)
- 2. Lower limb function (good and poor function)



> 30% had early OA features in PFJ and/or TFJ

Changes	PFJ (%)	Med TFJ (%)	Lat TFJ (%)
BMLs	22	14	22
Cartilage injury	49	29	28
Osteophytes	50	31	36
Meniscal tears	NA	29	25

Radiographic OA: PFJ OA = 5% TFJ OA = 4%

Contralateral uninjured knee OA: PFJ OA = 0% TFJ OA = 1%

*Not related to age, surgical delay, gender

Project

ala

Culvenor et al, Arthritis and Rheumatology, 2015

Return to Sport Questionnaire

12 months post ACLR

RTS questionnaire

- Have you returned to competitive sport?
- Which sport returned to?
- First month return to full competition?



RTS defined as:

Return to competitive sport/unrestricted training at least 2x per week (included running > 30 mins at least 2x per week)

Magnetic Resonance Imaging

MRI: 3Tesla, 3D



Magnetic Resonance Imaging

MRI OA KneeScoring System



Variables

Cartilage defects Bone marrow lesions (BMLs) Osteophytes Meniscal lesions

Sensitivity Analyses



Functional Capacity

Good lower-limb function (LSI ≥90%) VS Poor lower-limb function (LSI <90%)





Side to side hop test -40 cm hops Number of successful hops



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111 participants following ACLR

46 (41%) had returned to sport within 10 months following ACLR 13 (12%) RTS between 10-12 months

> Mean side to side hop test LSI was 79 (29)% 43 (39%) had poor function (LSI<90%)



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RTS within the first 10 months following ACLR was associated with greater odds of having BML at 1 year following ACLR OR: 2.72 (95%CI: 1.25 to 5.95)



No association between RTS within the 10 months following ACLR and Cartilage lesion (OR: 1.17; 0.52 to 2.63) Osteophyte (OR: 0.64; 0.29 to 1.43) Meniscal lesion (OR: 0.83; 0.39 to 1.76) at 1 year following ACLR

Sensitivity Analyses

Total n=111	Early OA features on MRI 12-months post-ACLR			
RTS <10-months post- ACLR (n= 46)	Cartilage lesion	Bone marrow lesion	Meniscal tear	
Isolated injury (n=27)	N=16.	N=13.	N=11.	
	OR: 1.07 (0.38, 3.00)	OR: 2.79 (0.93, 8.79)	OR 1.06 (0.38, 2.99)	
Combined injury (n=19)	N=16.	N=13.	N=14.	
	OR: 1.78 (0.41,7.73)	OR: 3.17 (0.96,10.49)	OR: 0.29 (0.06, 1.39)	

Sensitivity Analyses

Total n=111	Early OA features on MRI 12-months post-ACLR		
RTS <10-months post- ACLR (n=46)	Cartilage lesion	Bone marrow lesion	Meniscal tear
Poor function (n=23)	N=17. OR 1.5 (0.5 <i>,</i> 4.5)		N=11. OR 0.7 (0.2, 1.9)
Good function (n=23)	N=15. OR 1.1 (0.4, 3.0)	N=11. OR 2.2 (0.8, 5.9)	N=13. OR 1.2 (0.4, 3.4)



(Culvenor et al., PMR 2017)



Sports Med DOI 10.1007/s40279-016-0584-z	CrossMark
REVIEW ARTICLE	
Should Return to Sport be Delayed Unti Cruciate Ligament Reconstruction? Biol Considerations	l 2 Years After Anterior ogical and Functional
Christopher V. Nagelli ^{1,2,4,5} · Timothy E. Hewett ^{1,2,3,4,5}	

Downloaded from http://bjsm.bmj.com/ on October 1, 2017 - Published by group.bmj.com BJSM Online First, published on September 27, 2017 as 10.1136/bjsports-2016-097095 Original article

Functional performance 6 months after ACL reconstruction can predict return to participation in the same preinjury activity level 12 and 24 months after surgery

Zakariya Nawasreh, ^{1,2} David Logerstedt, ^{3,4} Kathleen Cummer, ¹ Michael Axe, ^{5,6} May Arna Risberg, ⁷ Lynn Snyder-Mackler^{1,4,5}

Bone Marrow Lesions



BMLs can fluctuate...

MOAKS score doesn't distinguish resolving, new or stable Most BMLs had signs of degeneration



BMLs can fluctuate...

Therefore, more likely to show changes (including load response changes) over a small time (e.g. compared with cartilage) May relate to further cartilage loss and osteophyte development over time



BMLs can fluctuate...

Longer term follow up studies are needed to: See if this relationship holds true over time Determine if BML progress to other OA features

Sensitivity analyses



Concomitant injury...

IS related to development of post-traumatic OA In this exploratory analyses, was NOT associated with increased odds of MRI OA changes in accelerated RTS



Functional capacity...

Stronger relationship between early RTS and BMLs in those with POOR function Time from surgery should not dictate RTS

- Objective tests of function are essential
- BUT !!!! Function was measure after RTS, and may have deteriorated

Take care with particiants who have poor functional capacity

Limitations

Retrospective recall in Return to Sport Questionnaire Function measured at 1 year No baseline imaging No standardised rehabilitation or RTS testing Small numbers in sensitivity analyses

FUTURE Directions......

Watch out for Brooke Patterson RCTs PhD opportunities!!!





Conclusion Caution with RTS < 10 months Function likely to be important















http://semrc.blogs.latrobe.edu.au/