An Analysis of Repeat ACL Injury and Return To Sport in 1000 Australian Soccer Players

Jonathan Manara, Lucy Salmon, Faisal Kilani, Gerardo Zelaya,

Claire Monk, Keran Sundaraj, Leo Pinczewski, Justin Roe,

Acknowledgements: Friends of the Mater, North Sydney Orthopaedic Research Group, Mater Hospital Sydney, North Sydney Orthopaedic & Sports Medicine Centre

ISAKOS CONGRESS 2023 Boston Massachusetts June 18–June 21

Declarations of Interest

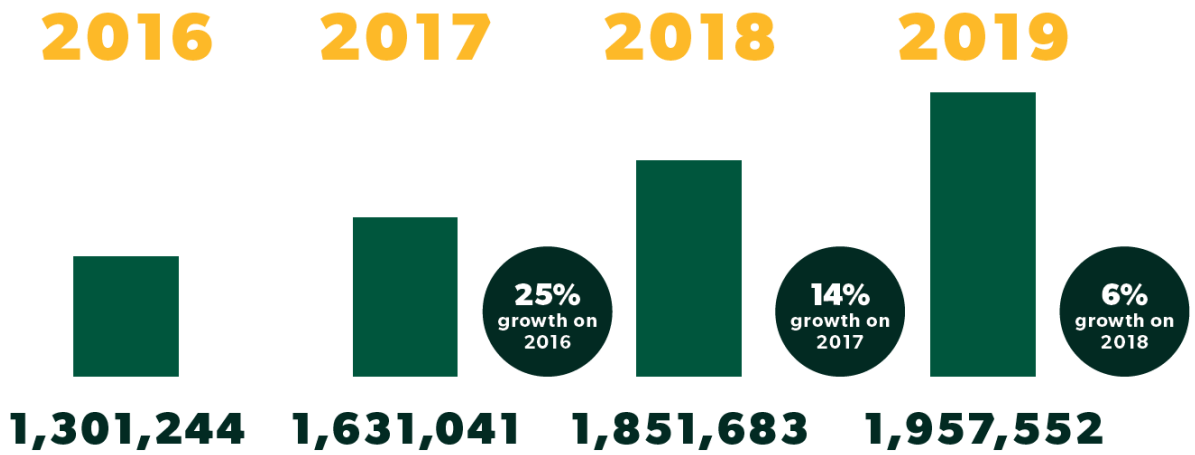
- JM, LS, FK, GZ, CM, KS: Nil

- Leo Pinczewski has:
  - Australian Biotechnolgies: IP royalties
  - Australian Biotechnology: Stock or stock Options
  - Australian Orthopaedic Association: Research support
  - Friends of the Mater Foundation: Research support
  - Signature Orthopaedics: IP royalties
  - Smith & Nephew: Research support

- Justin Roe has:
  - held shares in: 360KS
  - done consulting work for: Smith and Nephew
  - given paid presentations for: Depuy/Synthes
  - received institutional support from: Smith and nephew, Global Orthopaedics

Introduction

- In Australia participation in soccer involves 1.96 million



FFA National Participation Report 2019

- Soccer is the most popular team sport for both adults and children

- Australia has the highest rates of ACL injury and reconstruction worldwide and that rate is increasing, with a 74% rise in those under 25yrs from 2000-2015

Zbrojkiewicz et al., 2018

Methods & Surgical Technique

- Prospective database of ACL surgery
- ACL rupture sustained while participating in soccer at any level
- Primary ACLR with hamstring tendon autograft
  - undertaken at least five years earlier (2007-2015)

1000 ACL reconstructions with hamstring autograft in soccer players between 2007 and 2015

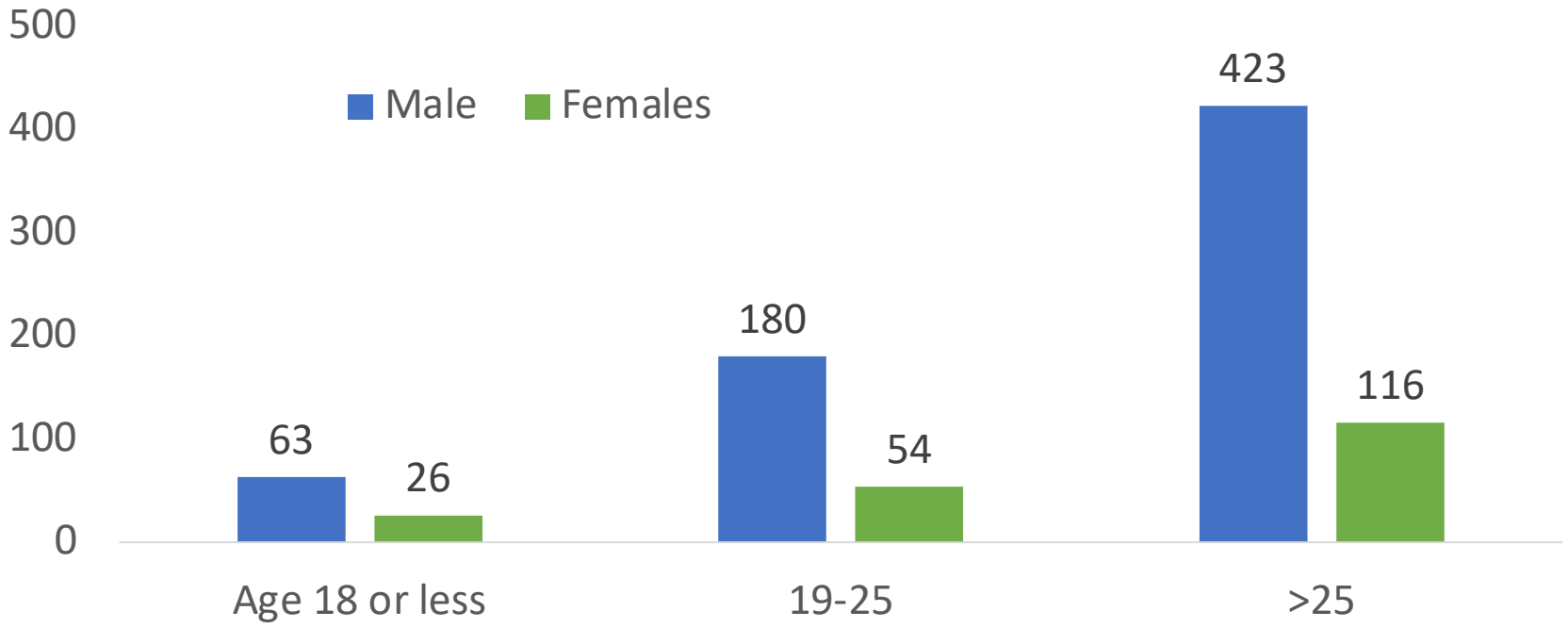
exclusions (n=7)
Refused (n=6)
died (n=1)

993 ACL reconstructions in soccer players

862 outcome determined (87%)
92 unable to locate
39 did not complete

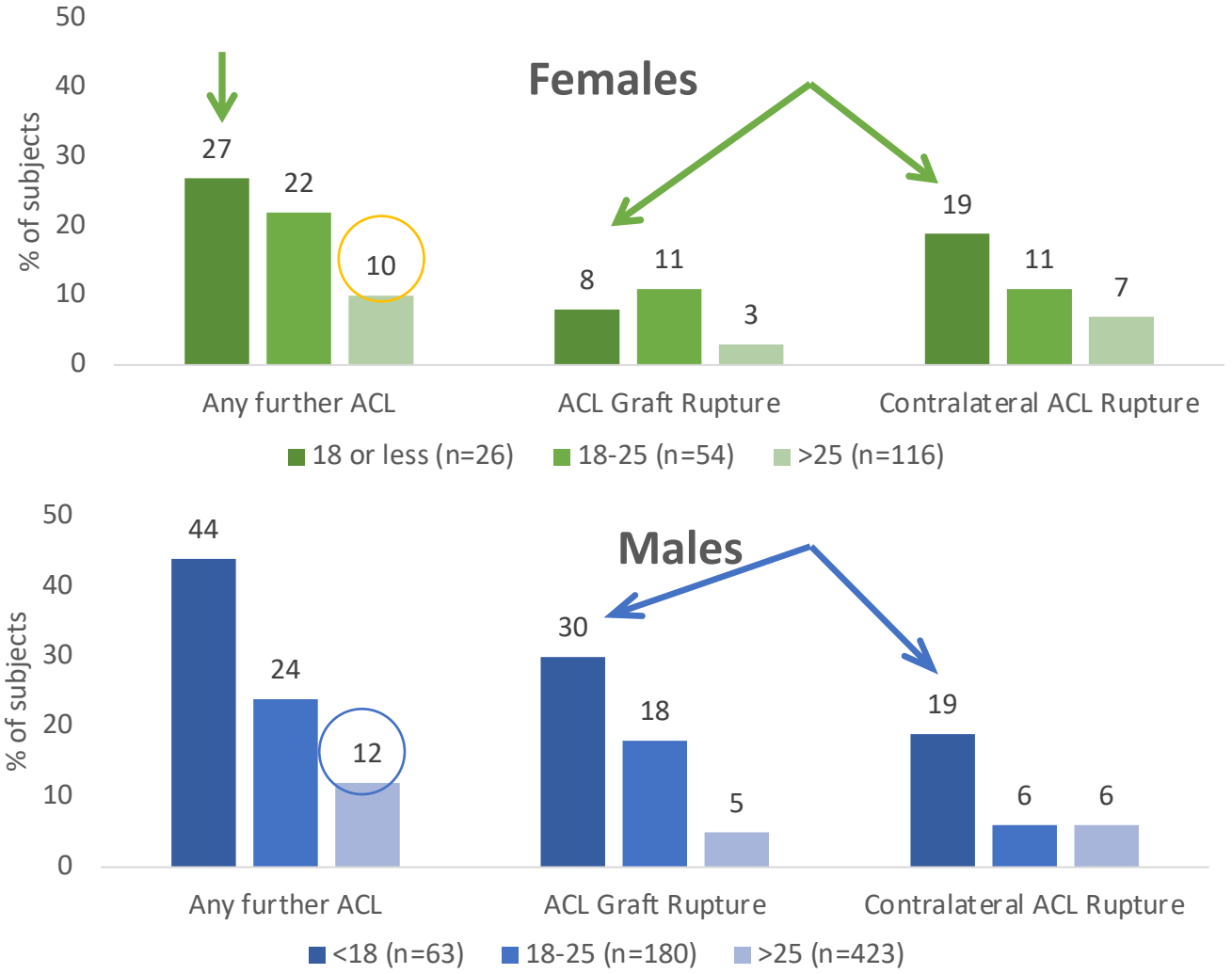
Demographics

- 666 males (77%), 196 females (23%)
- mean age of 30 years (range 13-62).
  - 54% > 25yrs



Repeat ACL Injury by Age

- ACL reinjury was most common in the young (at 27% of 26 patients).
- CACL injury was MORE common than ACL graft rupture in the young females.
- For males, ACL graft rupture was MORE common than CACL injury.
- For those patients over 25 years, any further ACL injury was 10 and 12% for females and males respectively.
- 3 young males (5%) sustained BOTH ACL graft and CACL injury



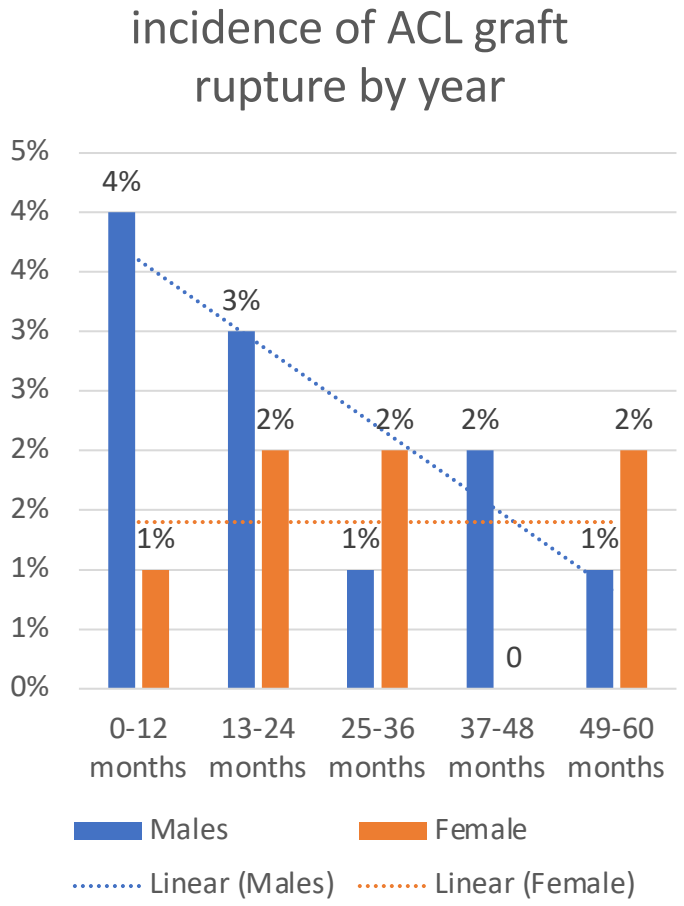
Predictors of ACL Graft Survival

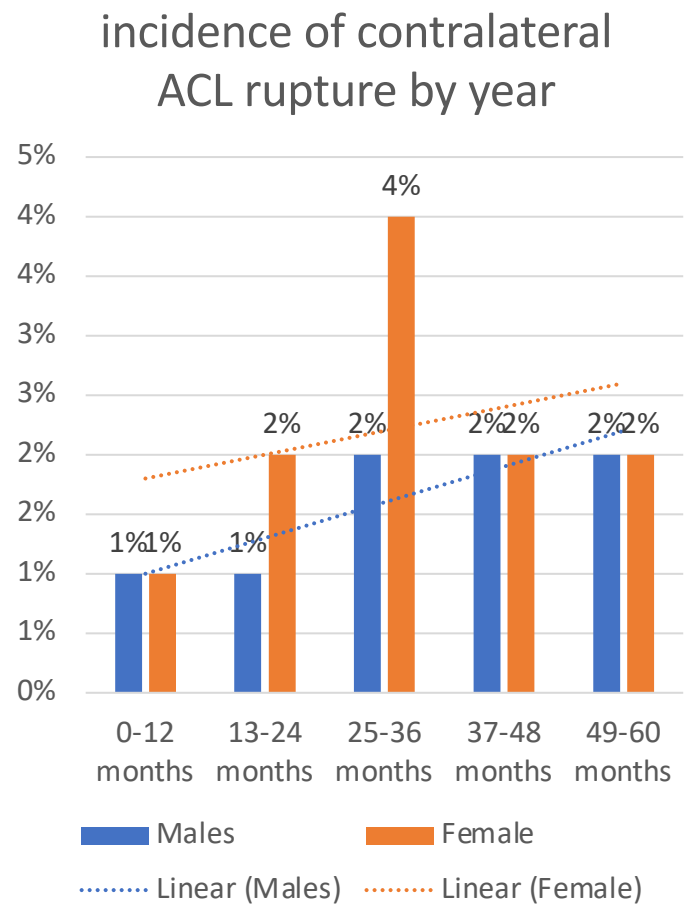
Significant Factors in Males	ACL Survival	HR (95% CI)	p value
Age (years)			
18 or less (n=63)	70%	7.2 (3.5-14.9)	0.001**
19-25 (n=180)	82%	3.9 (2.1-7.4)	0.001**
>25 (n=423)	94%	ref	
Significant Factors in Females			
Age (years)			
18 or less (n=26)	92%	3.1 (0.5-18.3)	0.222
19-25 (n=54)	89%	4.6 (1.1-18.2)	0.032**
>25 (n=116)	97%	ref	

- ***Non-significant factors***
  - return to soccer (p>0.135)
  - ACL graft diameter (p>0.562)
  - family history of ACL injury (p>0.900)
  - BMI 25 or more (p>0.684)

Timing of ACL Re-injury

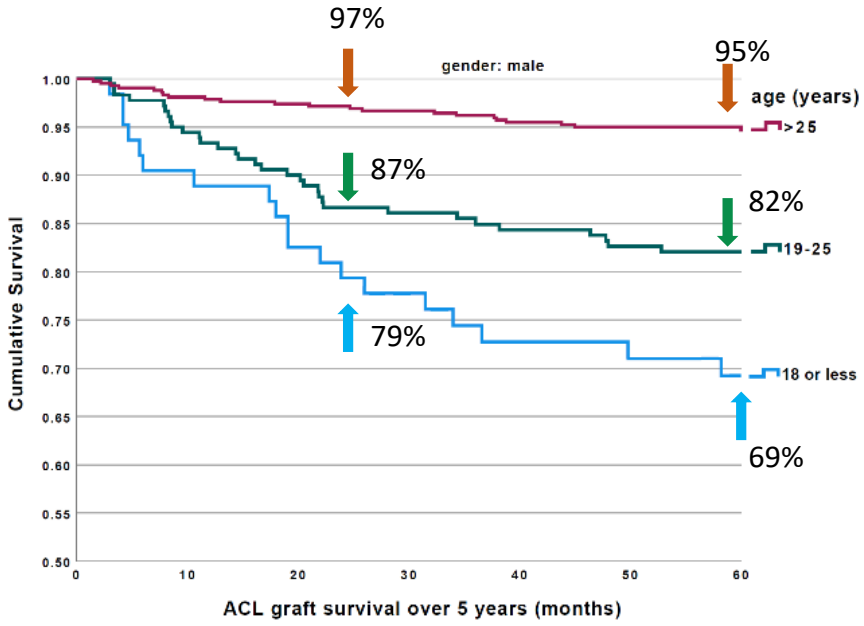
- The incidence of ACL graft rupture for males was highest at 4% and 3% in the first- and second-years post surgery.
- The incidence of Contralateral ACL rupture showed a spike of 4% in the 3rd year post surgery for females.



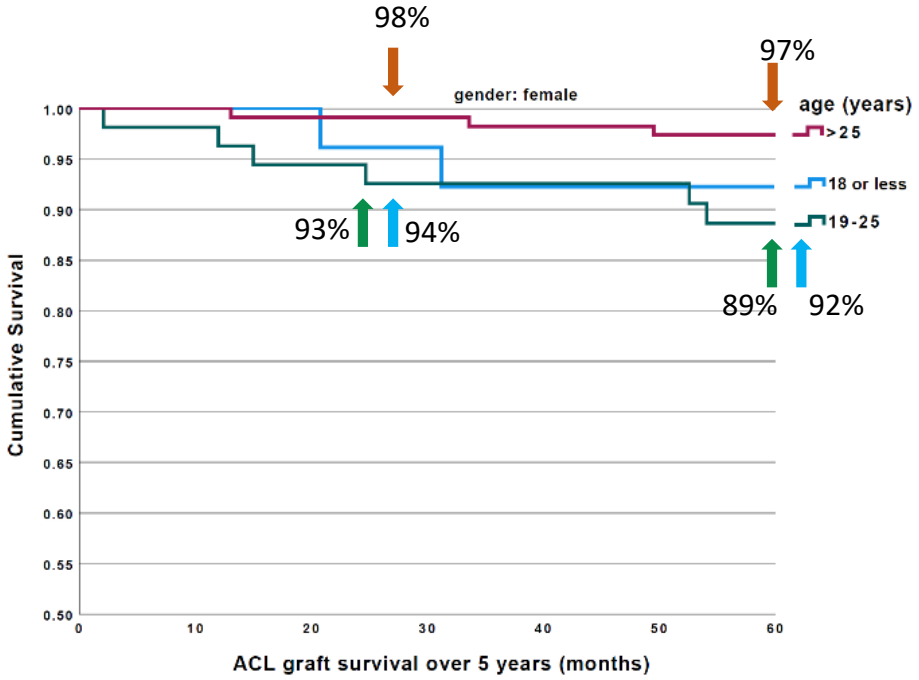


ACL graft survival by Age

- Kaplan Meir survival curves are displayed here for the significant factor of age on multivariate regression.
- Grafts in subjects under 18 years had a five year survival of 69% in males and 92% in females.
- Those between 19 and 25 years had a 5 year survival of 82% in males and 89% in females.
- Those over 25 yrs had a 5 year survival of 95% or more.



Males



Females

Predictors of CACL Survival

Significant Factors in Males		ACL Survival	HR (95% CI)	p value
Age (years)	18 or less (n=63)	79%	3.6 (1.8-7.1)	0.001**
	19-25 (n=180)	93%	1.0 (0.5-2.1)	0.953
	>25 (n=423)	94%		
Return to soccer	Yes (n=469)	89%	10.5 (2.5-43)	0.001
	No (n=197)	99%		
Significant Factors in Females				
Age (years)	18 or less (n=26)	81%	3.1 (1.0-9.5)	0.046**
	19-25 (n=54)	88%	1.7 (0.6-4.9)	0.335
	>25 (n=116)	93%	ref	
Return to soccer	Yes (n=133)	85%	38.3 (0.7-2086)	0.074
	No (n=63)	100%		

Non-significant factors were family history of ACL injury ($p>0.189$) and BMI 25 or more ($p>0.233$)

Predictors of Return to Soccer

	Return to Sport	HR (95% CI)	p value
Age (years)			
18 or less (n=73)	82%	3.2 (1.5-7.0)	0.004**
19-25 (n=187)	80%	2.3 (1.5-3.7)	0.001**
>25 (n=342)	64%	ref	
ACL RSI			
60 or more (n=286)	80%	3.9 (2.7-5.5)	0.001*
<60 (n=161)	54%		

Non-significant factors were gender (p=0.492), BMI 25 or more (p=0.330) and ACL graft diameter (p=0.799), and family history of ACL injury

Conclusions

- ACL Graft Survival at 5 years in Australian Soccer players:
  - 94% for females and 88% for males.
- ACL graft rupture is more common in males
- Contralateral ACL injury is more common in females
- Risk factors for further ACL injury (graft rupture or CACL injury):
  - younger age at time of surgery,
  - male gender,
  - returning to soccer.
- Graft diameter has no influence on re-rupture rate.
- 70% of patients successfully return to soccer after an ACLR
  - younger age and a higher RSI score were positive predictors

References

- Hulteen RM, Smith JJ, Morgan PJ, et al. Global participation in sport and leisure-time physical activities: A systematic review and meta-analysis. *Prev Med.* 2017;95:14-25.

- Zbrojkiewicz D, Vertullo C, Grayson JE. Increasing rates of anterior cruciate ligament reconstruction in young Australians, 2000–2015. *Med J Aust.* 2018;208(8):354-358.

- Ekstrand J, Gillquist J, Möller M, Oberg B, Liljedahl SO. Incidence of soccer injuries and their relation to training and team success. *Am J Sports Med.* 1983;11(2):63-67.