Even A Moderate Pivot Shift Phenomenon Is A Preoperative Risk Factor For Ramp Lesions In Patients Undergoing Anterior Cruciate Ligament Reconstruction

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ISAKOS Congress 2025
COI disclosure

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The authors have no financial conflicts of interest to disclose concerning the presentation.

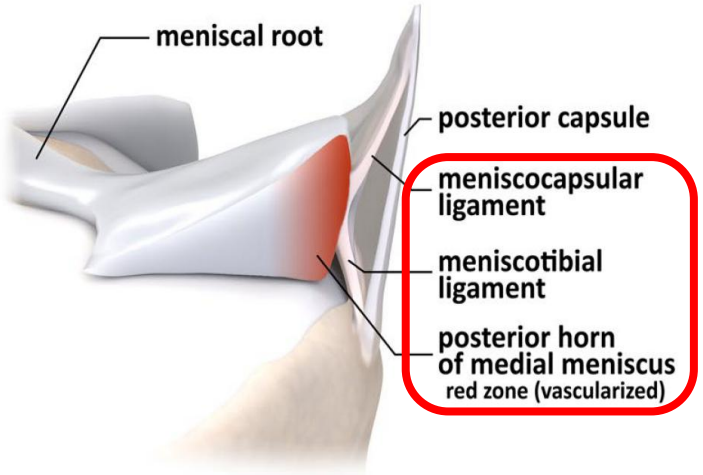
What is ramp lesion?

- A tear of the peripheral meniscocapsular attachments of the posterior horn of the medial meniscus.

Liu X, et al. AJSM 2011
Sonnery-Cottet B, et al. AJSM 2018

- It is typically associated with ACL tears, with a reported occurrence in 9% to 30% of all ACL tears.

Seil R, et al. KSSTA 2008
Liu X, et al. AJSM 2010



Taneja, et al. Insights Imaging 2021

There are some cases in which ramp lesions are not easily found despite using transcondylar or posteromedial portal views…

Risk factors for ramp lesions

Understanding the factors associated with ramp lesions can reduce intraoperative oversights

Male sex

chronic injuries

concomitant LM tears

gross pivot shift

revision ACLR

aged < 30

Sonnery-Cottet et al. AJSM 2018

Thaunat et al. AJSM 2021

Tashiro et al.KSSTA 2020

Few studies have used categorical analyses, and rigorously evaluated the relationship between ramp lesions and the pivot shift phenomenon

Purpose of this study

① To identify the key variables necessary for investigating preoperative factors associated with ramp lesions in ACL-injured knees

② To elucidate more rigorously the relationship between ramp lesions and the pivot-shift phenomenon using the modified IKDC criteria

Subjects

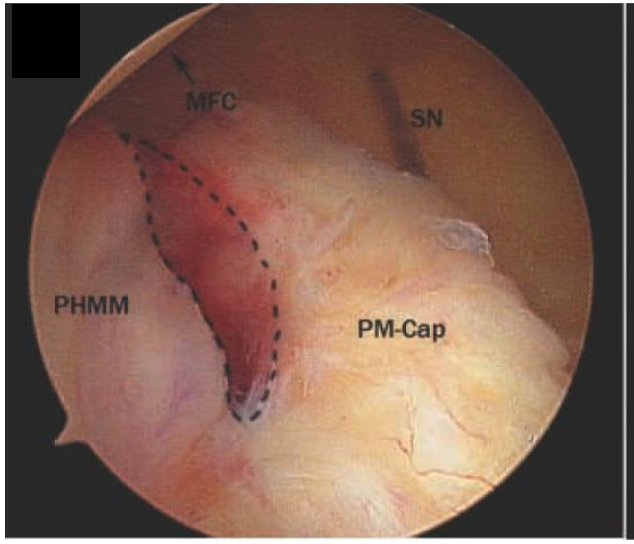
【Inclusion】
Primary ACLR patients at our Hospital (2017-2023)

【Exclusion】
- Past ligamentous and meniscus injuries in the affected knee
- Accompanying grade 2 or 3 ligament injuries

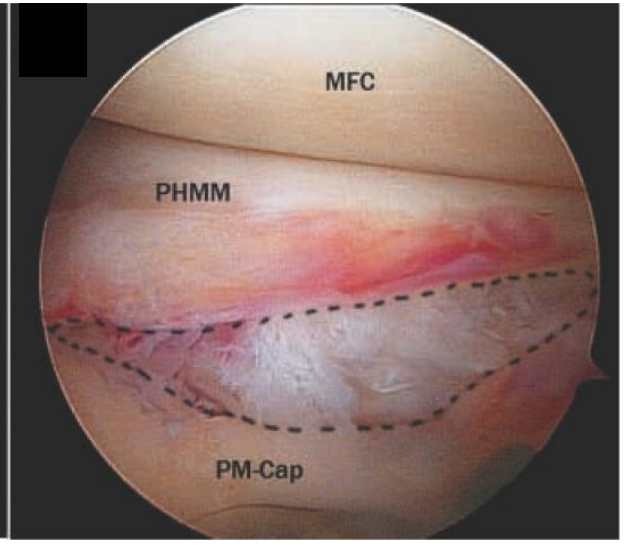
Arthroscopic evaluation

- A ruptured ACL was confirmed arthroscopically, and meniscus injury was managed according to the injury status.

- The ramp lesions were diagnosed using transcondylar view or posteromedial portal view in all cases.



transcondylar view



posteromedial portal view

Liu X, et al. AJSM 2011

Statistical analysis

Dependent	Independent variables
Ramp lesions	• Age • Sex • KT-1000 • LM lesion • Continuing sports after ACL tear ・Giving way ・Time to surgery ・Pivot shift test

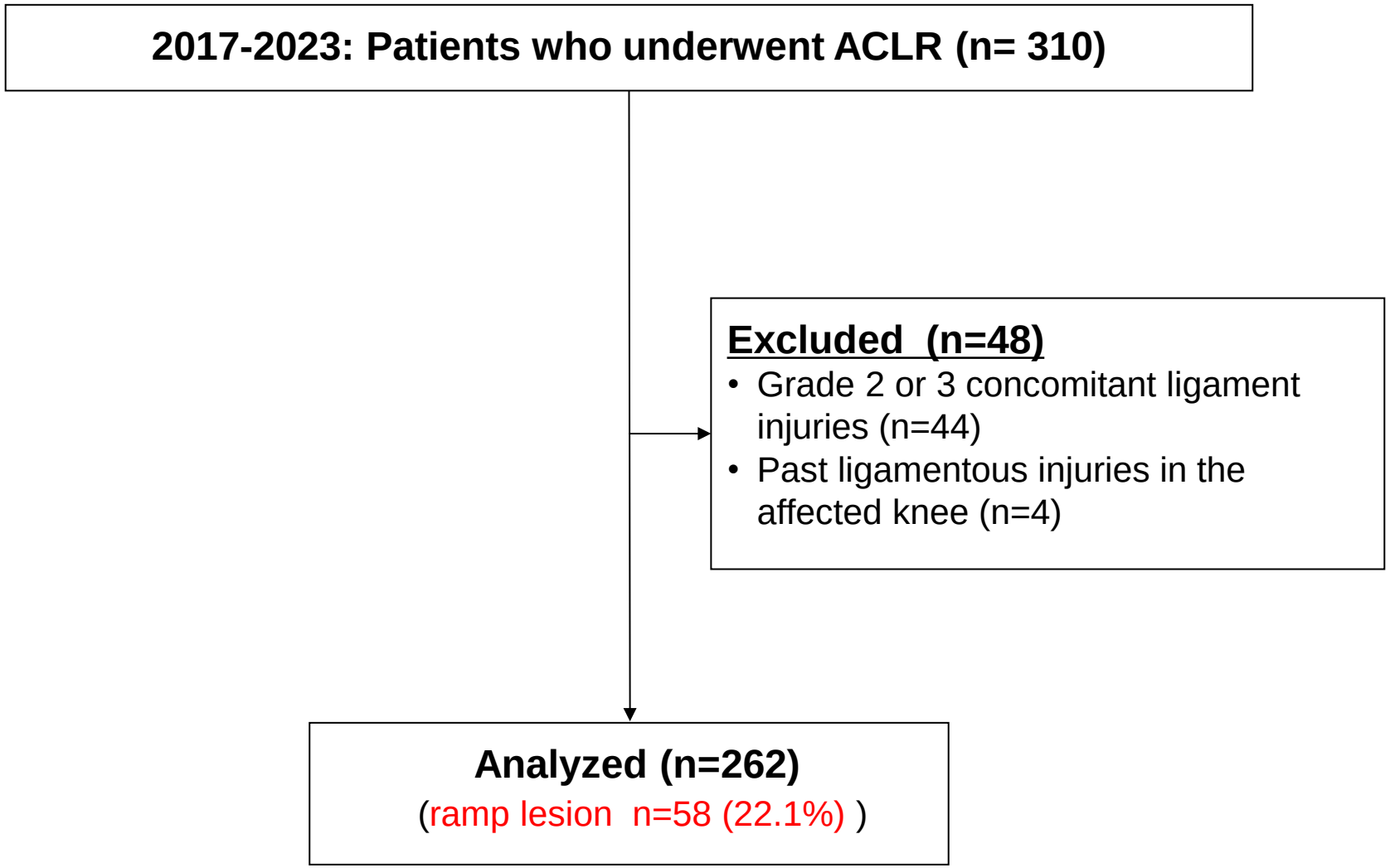
① Univariate logistic regression analysis
② Multivariate logistic regression analysis
③ Categorical analysis of extracted factors

Modified IKDC criteria

Grade 0	Negative
Grade 1	Subtle glide
Grade 2	Glide
Grade 3	Between grade 2 and 4
Grade 4	Clunk
Grade 5	Between grade 4 and 6
Grade 6	Gross

Koga, et al. KSSTA 2014
Katakura, et al. Knee 2019

Patient flow diagram



Logistic Regression Analysis

Univariate Logistic Regression Analysis

	OR	95%CI	P value
Age (y)	0.967	0.941-0.994	0.02
Sex (male)	1.860	1.020-3.420	0.04
Anterior knee laxity SSD (mm)	1.020	0.952-1.090	0.63
Pivot shift test (grade)	1.580	1.230-2.020	< 0.01
LM lesion (n)	1.120	0.591-2.120	0.73
Time to surgery (months)	1.000	0.997-1.010	0.38
Giving way (n)	1.430	0.918-2.240	0.11
Continuing sports after ACL tear(n)	1.570	0.86-2.89	0.14

P values in red indicate variables with P < 0.2

Multivariate Logistic Regression Analysis

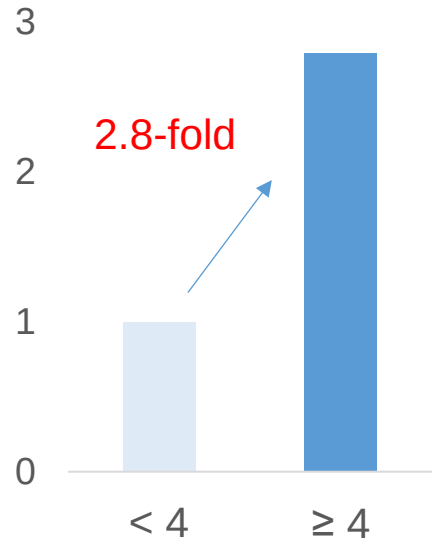
	OR	95%CI	P value
Pivot shift test (grade)	1.560	1.210-2.020	< 0.01
Age (y)	0.966	0.939-0.995	0.02
Sex (male)	2.170	1.120-4.190	0.02
Giving way (n)	1.530	0.874-2.670	0.14
Continuing sports after ACL tear (n)	0.916	0.428-1.960	0.82

P values in red indicate variables with P < 0.05

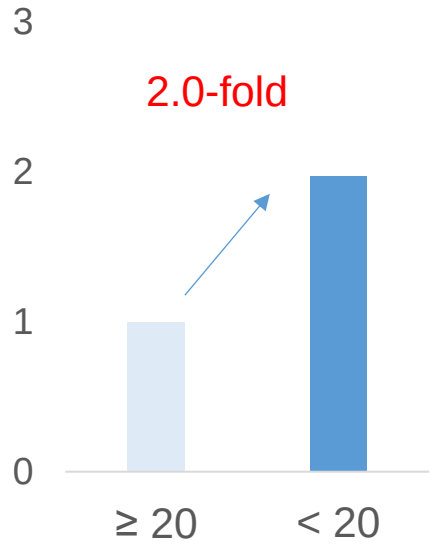
Categorical Analysis

		OR (95%CI)	P value
Pivot shift test	< 4 (n=146)	1.000 (reference)	
	≥ 4 (n=116)	2.790 (1.520-5.110)	**< 0.001**
Age (y)	≥ 20 (n=199)	1.000 (reference)	
	< 20 (n=63)	1.970 (1.040-3.730)	**0.04**
Sex	Female (n=121)	1.000 (reference)	
	Male (n=141)	2.030 (1.080-3.820)	**0.03**

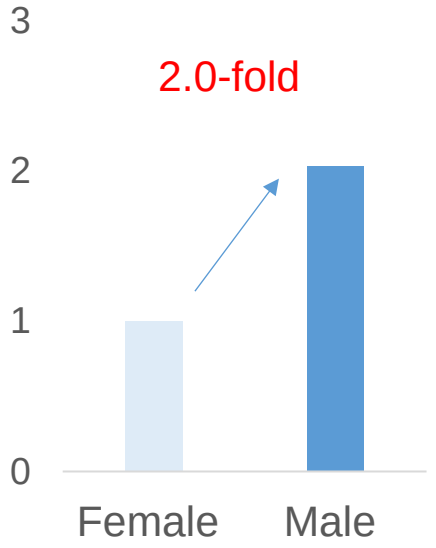
Greater pivot shift



Age < 20



Male

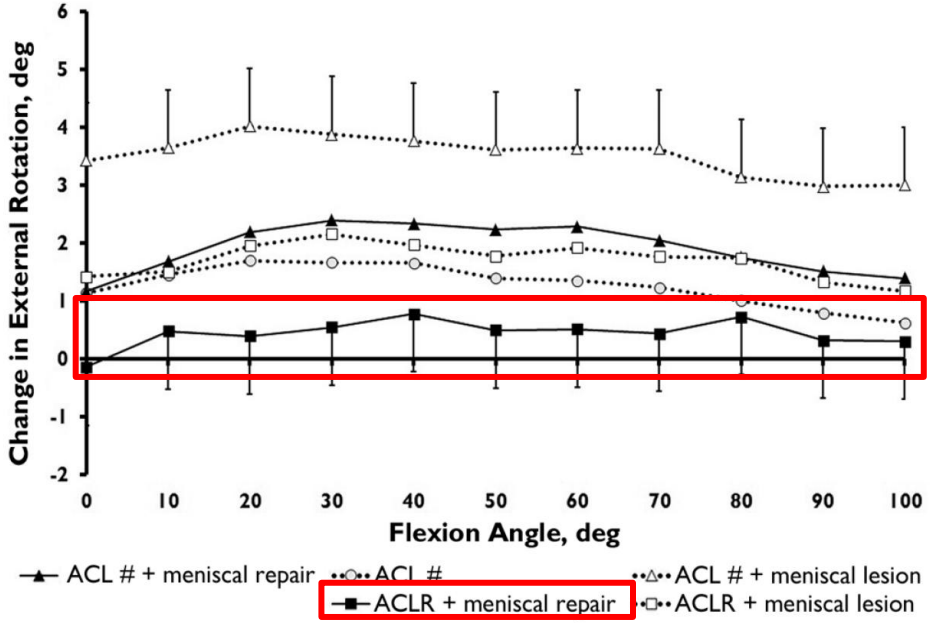


Ramp lesions & rotational instability

- External rotation was restored with ACLR combined with **posterior meniscocapsular repair**.

- A pivot shift was recovered when ACLR was performed simultaneously with a **meniscotibial and meniscocapsular repair**.

Stephen JM, et al. AJSM 2016
DePhillipo NN, et al. AJSM 2018



Conclusion

- **A greater pivot shift**, **younger age**, and **male sex** were associated with ramp lesions.
- Even a **moderate pivot shift phenomenon** significantly associated with ramp lesions, along with younger age and male sex

References

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3. Sonnery-Cottet B, et al. AJSM. 2014
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