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Magnetic Resonance Imaging at 120° Flexed-knee Position Is A Novel Method for Preoperative Detection of Meniscal Ramp Lesion in Anterior Cruciate Ligament-injured Knee

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Faculty Disclosure Information

- Nothing to disclosure



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Background

Meniscal ramp lesion :

Longitudinal tears of the posterior meniscus horn (MMPH) and/or posterior meniscocapsular structure associated with anterior cruciate ligament (ACL) injury

Hamberg et al. J Bone Joint Surg Am. 1983

Thaunat et al. AJSM. 2021

Diagnostic accuracy of ramp lesion on magnetic resonance imaging (MRI)

Sensitivity, 27.3-84.6%; Specificity, 75.0-94.0%

Koo et al. AJSM. 2022

45.9% of meniscotibial ligament injuries (Thaunat type 3) were overlooked.

Thaunat et al. AJSM. 2021

Preoperative diagnostic accuracy of meniscal ramp lesion is not still sufficiently



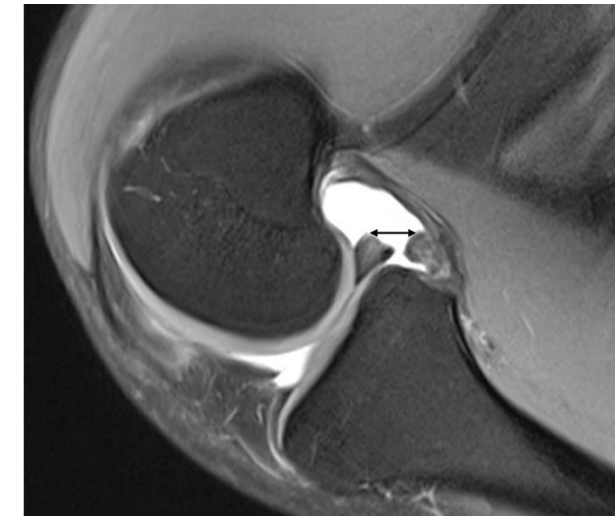
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Purpose & Hypothesis

Demonstration of instability of ramp lesions by 120° flexion sagittal MRI



Nonaka et al. Arthroscopy. 2024

Purpose

To assess the accuracy of MRI in detecting meniscal ramp lesion at 120° flexed-knee position and to compare with that in near extended-knee position.

Hypothesis

The diagnostic performance of MRI in 120° flexed-knee position would be better than that in extended-knee position.



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Materials & Methods

Aug. 2018- Jan. 2024

171 ACL-injured knee

Inclusion

- MRI in 120° flexed-knee and in near-extension **at the same time**

Exclusion

- MRIs at different time (10 knees)
- Loss of obtaining either MRIs (7 knees)

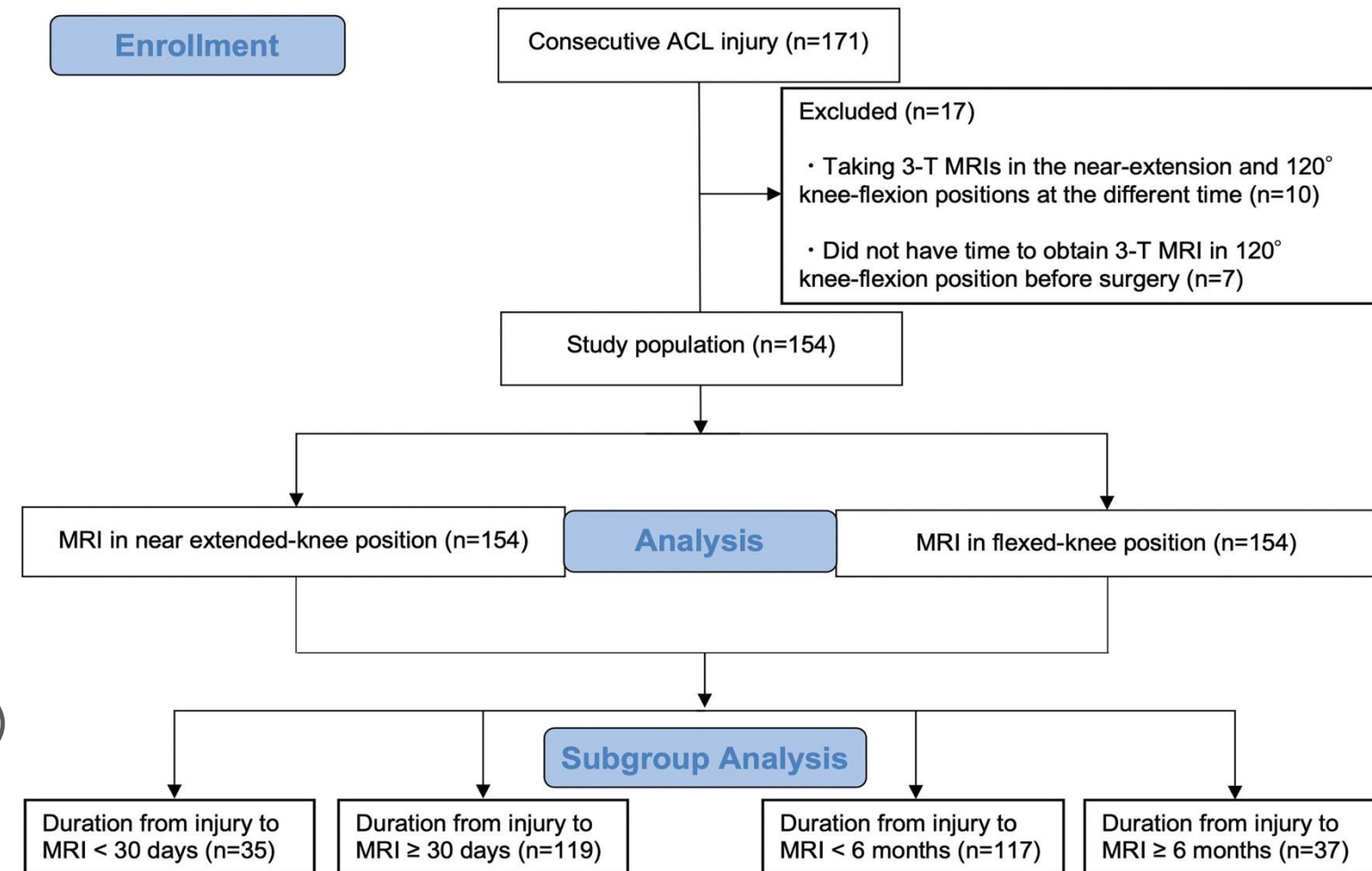
154 knees were included.



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Taking MRI in 120° flexed-knee position

Performed preoperatively in all cases of ACL reconstruction
Median duration from injury to MRI, 65.5 days (11-14965 days)

- Lateral position • Knee flexion of **120°**
- Using coil for core body imaging
- Turbo spin-echo method
- Sagittal view of fat-saturated proton density-weighted image with a 2-mm slice thickness
- TR(Repetition Time) : 2820 msec
- TE(Echo Time) : 9.1 msec
- Slice thickness : 2 mm

*Figure is the image taking MRI of left knee



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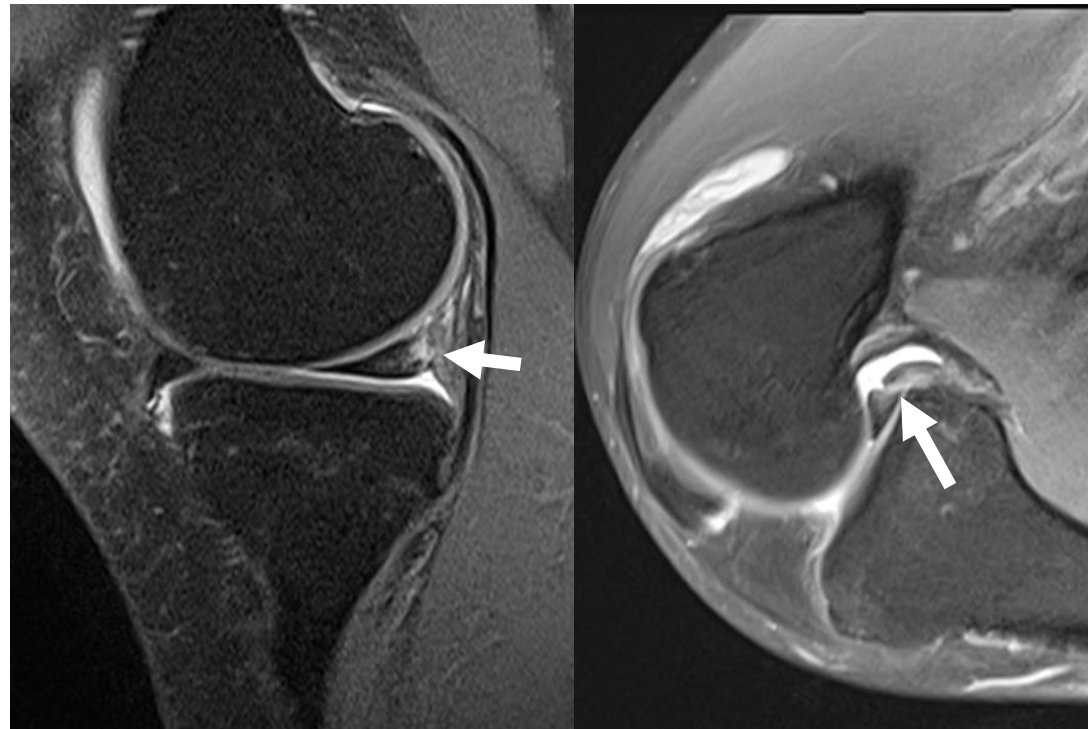
Diagnosis of Ramp Lesion on Sagittal View of MRI

Yeo et al. Skelet Radiol. 2018

Irregularity of the posterior MMPH

near-extension

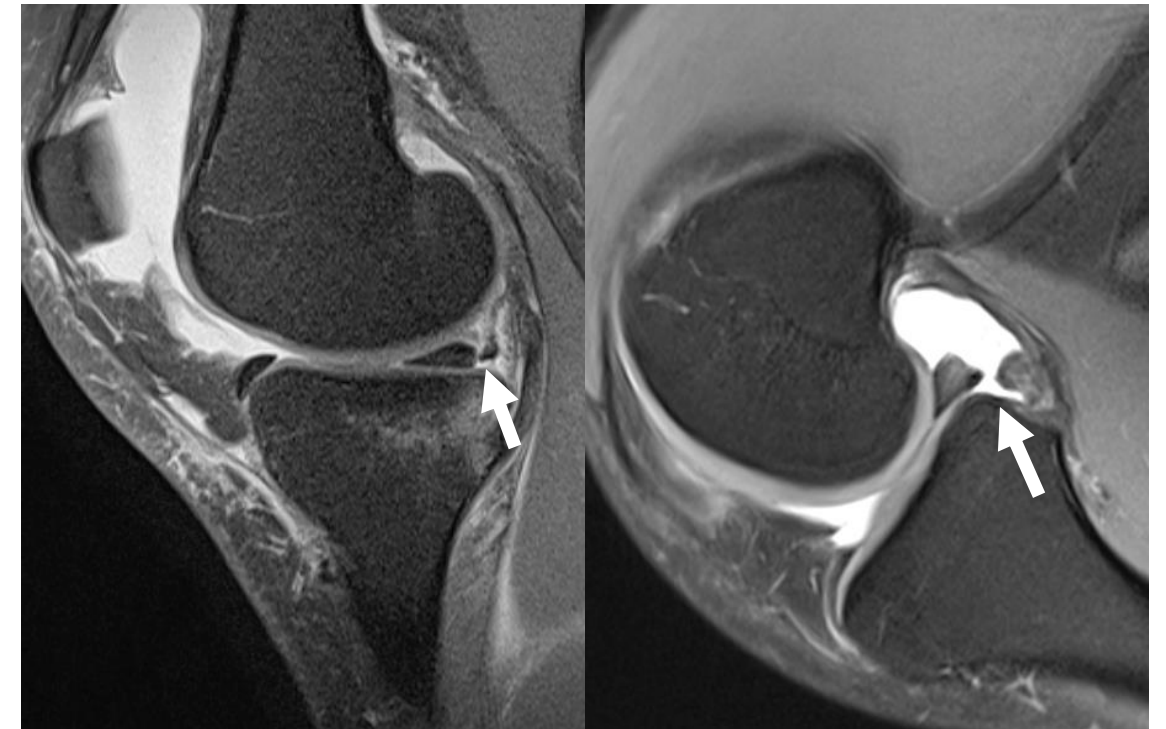
120° flexion



Fluid filling between the MMPH and the capsular margin

near-extension

120° flexion



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Arthroscopic Confirmation

- All participants underwent ACL reconstruction.
- Trans-notch view and posteromedial portal view on 4 mm–diameter, 45° arthroscope (Stryker) was used to confirm the presence of meniscal ramp lesion.

trans-notch view

probing from posteromedial portal

posteromedial view

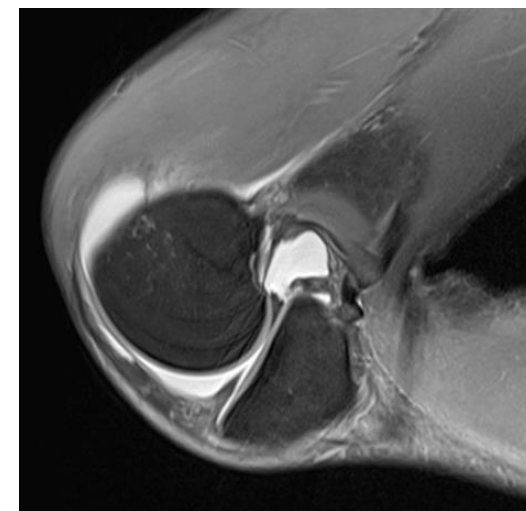


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Result



	knee extension	knee flexion	P value
Sensitivity (%)	69.4 (43/62)	91.9 (57/62)	0.003
Specificity (%)	77.2 (71/92)	94.6 (87/92)	0.001
Accuracy (%)	74.0 (114/154)	93.5 (144/154)	< 0.001
PPV (%)	67.2 (43/64)	91.9 (57/62)	0.001
NPV (%)	78.9 (71/90)	94.6 (87/92)	0.002



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Sub-analysis (MRI in near-extension vs. in 120° flexion at Acute and Chronic phase)

	Acute (< 30 days), n=35			Non-acute (≥ 30 days), n=119			Chronic (≥ 6 months), n=37			Non-Chronic (< 6 months), n=117		
	Extension	120° flexion	p value	Extension	120° flexion	p value	Extension	120° flexion	p value	Extension	120° flexion	p value
	MRI	MRI		MRI	MRI		MRI	MRI		MRI	MRI	
Sensitivity	69.2	100	0.047	69.4	89.8	0.011	50.0	75.0	0.14	76.1	97.8	0.002
Specificity	59.1	100	<0.001	82.9	92.9	0.059	95.2	95.2	0.50	71.8	93.0	<0.001
AUC of ROC	0.642	1.000	<0.001	0.761	0.913	<0.001	0.726	0.875	0.01	0.740	0.954	<0.001



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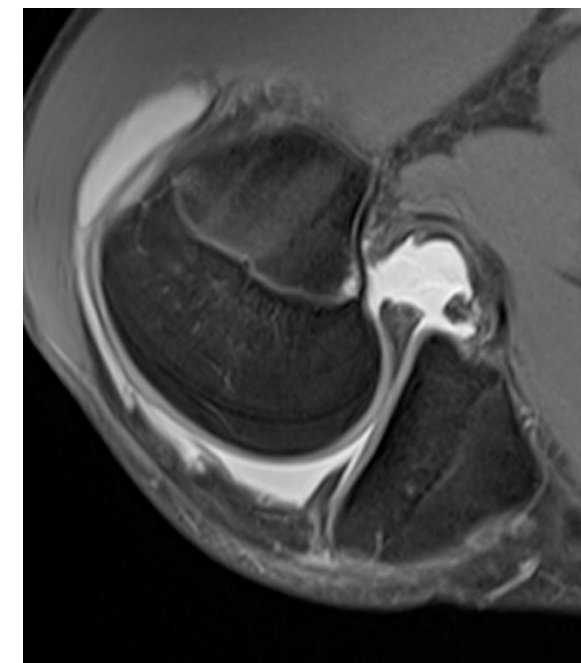


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Discussion & Conclusion

MRI in 120° flexed-knee position is superior to diagnose ramp lesion than as follows;

- In other previous reports
- MRI in near-extended position
- Especially in case of acute injury



MRI in 120° flexed-knee position is novel method for detecting meniscal ramp lesion in ACL-injured knee!



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Strength & Limitation

Strength

- Comparison of two MRI modalities taking **at the same time.**

Limitation

- 120° of knee flexion as the optimal angle for detecting meniscal ramp lesions is unknown.
- Retrospective study.



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1. Hamberg P, Gillquist J, Lysholm J. Suture of new and old peripheral meniscus tears. *J Bone Joint Surg Am.* 1983;65(2):193–197.
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4. Nonaka S, Hatayama K, Kakiage H, Terauchi M, Hashimoto S, Chikuda H. Posterior displacement of meniscal ramp lesion is observed on flexed knee magnetic resonance imaging of anterior cruciate ligament-deficient knees. *Arthroscopy.* 2024;40(3):879-886.



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