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Preoperative ACL-RSI Can Independently Assess Psychological Aspects Without the Influence of Knee Instability: A Multi-center Study (Chiba LEAF Study)

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Introduction

Anterior Cruciate Ligament(ACL) injury frequently occur in sport activities. ACL reconstruction (ACLR) is recommended for return to sports (RTS).

RTS after ACLR

Rate of return to pre-injury sports level after ACLR : 63%

Arden CL et al. 2014 Br J Sports Med

Physical factors (knee pain, muscle weakness, et al.)

Psychological factors (fear or anxiety of reinjury, et al.)

Introduction : ACL-RSI

- ACL-RSI is PROM assessing psychological readiness in ACL injury.
- There is preoperative exercise fear in ACL injury. Arden CL et al. 2013 Am J Sports Med
- Significant preoperative ACL-RSI differences exist between those who return to sports and those who do not.

Theumissen WWES et al. 2020 Knee Surg Sports Traumatol Arthrosc

However , there are few reports examining the factors that affect preoperative ACL-RSI.

The aim of this study is

To examine preoperative factors related with preoperative ACL-RSI in ACLR cases.

Method :

Registered cases in **Chiba LEAF study**
493 cases (Dec 2022 ～ Jan 2015)

↓

Preoperative ACL-RSI evaluated : 238 cases

↓ Excluded 48 cases

Final analysis : 124 cases

＜Exclusion criteria＞

Missing data for

waiting period

Lachman test(Lachman)

Pivot shift test(PS)

Marx Activity Score(Marx)

Arthroscopic findings

Method : Evaluation criteria

Evaluation criteria

Preoperative Assessment

・Patient demographic
(Age、Gender、Body Mass Index(BMI))
・Waiting period
・ACL-RSI
・Marx、Tegner Activity Score (Marx, Tegner)
・PROMs：Knee Injury and Osteoarthritis Outcome Score (KOOS)、Lysholm score

Intraoperative Assessment

・knee instability (Lachman, PS)
・Arthroscopic findings (cartilage/meniscal injury)

- Lachman・PS：
  evaluated by IKDC classification
  →grade A or B：stable
  grade C or D：Unstable

- Cartilage injury：
  evaluated by ICRS grading at medial/lateral femorotibial (FT) joint and patellofemoral (PF) joint
  Grade 3 or higher → significant injury

- Meniscal injury : Defined as present if repaired or resected

Method : Statical analysis

Univariate analysis

Age, BMI, Waiting period, Marx, Tegner, KOOS, Lysholm

→Spearman correlation coefficient

Gender, Lachman, PS, Cartilage injury, Meniscal injury

→Mann-Whitney U test or Kruskal-Wallis test

Multiple regression analysis

Dependent variable：preoperative ACL-RSI

Independent variable：Age, Gender, BMI, waiting period, Marx, Lachman, PS, Meniscal injury (Medial / Lateral)

Result : Characteristics

Age(y)	28.7±13.3
Gender	Male70 Female54
BMI (kg/㎡)	23.4±3.6
Waiting period(M)	13.6±53.9
ACL-RSI	50.2±21.2
Lachman	Stable70 Unstable54
PS	Stable85 Unstable39
Marx	10.0±5.6
Tegner	5.6±1.8

KOOS-Symptom	82.9±14.3
KOOS-pain	88.3±13.2
KOOS-ADL	90.2±11.7
KOOS-Sport	49.2±26.7
KOOS-QOL	52.4±22.9
Lysholm	78.7±15.3
MM injury	Injured 35 Uninjured 89
LM injury	Injured 61 Uninjured 63

Result:
Univariate analysis

Categorical variable

	ACL-RSI		P
Gender	M 51.6±19.8	F 48.5±23.0	0.55
	Injured	**Uninjured**	
Lachman	50.0±19.5	50.7±22.7	0.98
PS	49.1±21.4	50.8±21.3	0.73
Medial FT injury	49.4±19.4	50.3±21.5	0.78
Lateral FT injury	48.6±23.4	50.4±21.1	0.75
PF injury	37.1±18.0	50.9±21.1	0.15
MM injury	46.2±21.5	51.8±21.0	0.28
LM injury	53.5±18.0	47.0±23.7	0.13

Continuous variable

	ρ	P	95%CI
Age	**-0.21**	**0.003**	-0.30~0.027
BMI	-0.006	0.45	-0.27~0.0051
Waiting period	**-0.17**	**0.051**	-0.32~-0.043
Marx	**0.35**	**<0.001**	0.13~0.39
Tegner	**0.18**	**0.0017**	0.061~0.33
KOOS			
Symptom	0.1	0.18	-0.10~0.19
Pain	**0.15**	**0.028**	-0.094~0.20
ADL	0.06	0.34	-0.17~0.13
Sport	**0.17**	**0.014**	-0.024~0.26
QOL	**0.24**	**<0.001**	0.040~0.32
Lysholm score	**0.16**	**0.025**	-0.079~0.21

Result : Multiple regression

Dependent variable	Independent variable	P value	β	95% CI
ACL-RSI	Marx	**0.026**	0.26	0.16-1.9
	Waiting period	0.16	-0.13	-0.12-0.020
	Lachman	0.45	0.072	-2.5-5.6
	PS	0.65	-0.042	-5.3-3.3
	MM injury	0.21	-0.12	-7.0-1.5
	LM injury	0.24	0.11	-1.6-6.3

＊Adjusted by age, gender, and BMI

Discussion：The predictor of ACL-RSI

The interval between injury and surgery, age, preinjury sport participation and subjective knee score effect on psychological readiness.

Timothy C Sell et al. 2024 Sports Med Open.
Kate E Webster et al. 2018 Am J Sports Med.

The Knee laxity has no association with psychological readiness.

Timothy C Sell et al. 2024 Sports Med Open.

Cartilage injury and meniscus injury don’t effect on ACL-RSI.

Kate E Webster et al. 2018 Am J Sports Med.

This study

- Significant predictor of ACL-RSI is only Marx in multiple regression.
- Lachman, PS, cartilage injury and meniscus injury didn’t effect on ACL-RSI.
  →The result suggests that the anterior-posterior and rotational instability of the knee may not affect psychological readiness.

Conclusion

- The significant predictor of ACL-RSI using a multiple regression analysis was only **Marx activity score.**

- In univariate analysis,
  - age was negatively
  - Tegner, Marx, KOOS-Sports, and KOOS-QOL were positively correlated with ACL-RSI.

Reference

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