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Risk factors of the residual postoperative anterior tibial subluxation after anatomical ACL reconstruction: A 2-year follow-up study

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Introduction

Anterior tibial subluxation (ATS)

- ✓ Static tibiofemoral relationship on the sagittal plane

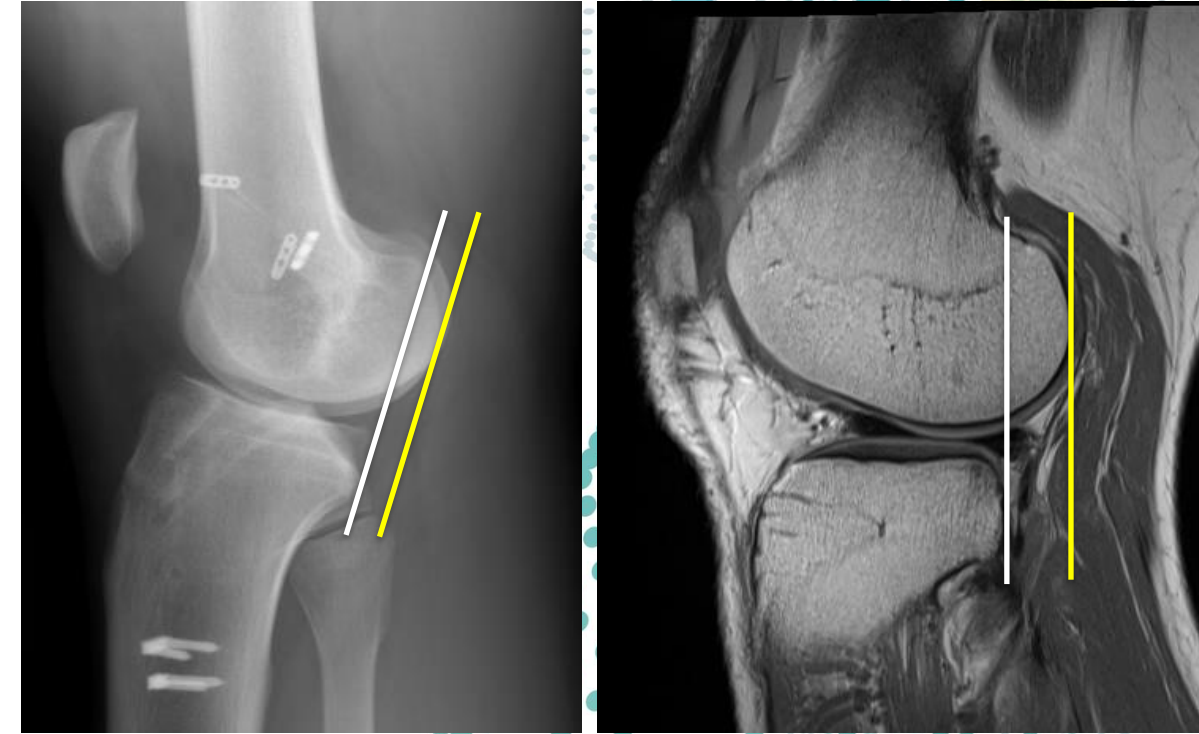
Preoperative ATS

- ✓ Various risk factors

Chronic ACL deficiency [1], meniscus lesions [2],
cartilage lesions [3], posterior tibial slope (PTS) [4]

- ✓ Lead to residual pivot shift test or failure following ACL reconstruction

However, risk factors for postoperative ATS are unclear



Purposes

- ✓ To identify the factors that influence postoperative
ATS following anatomical ACL reconstruction



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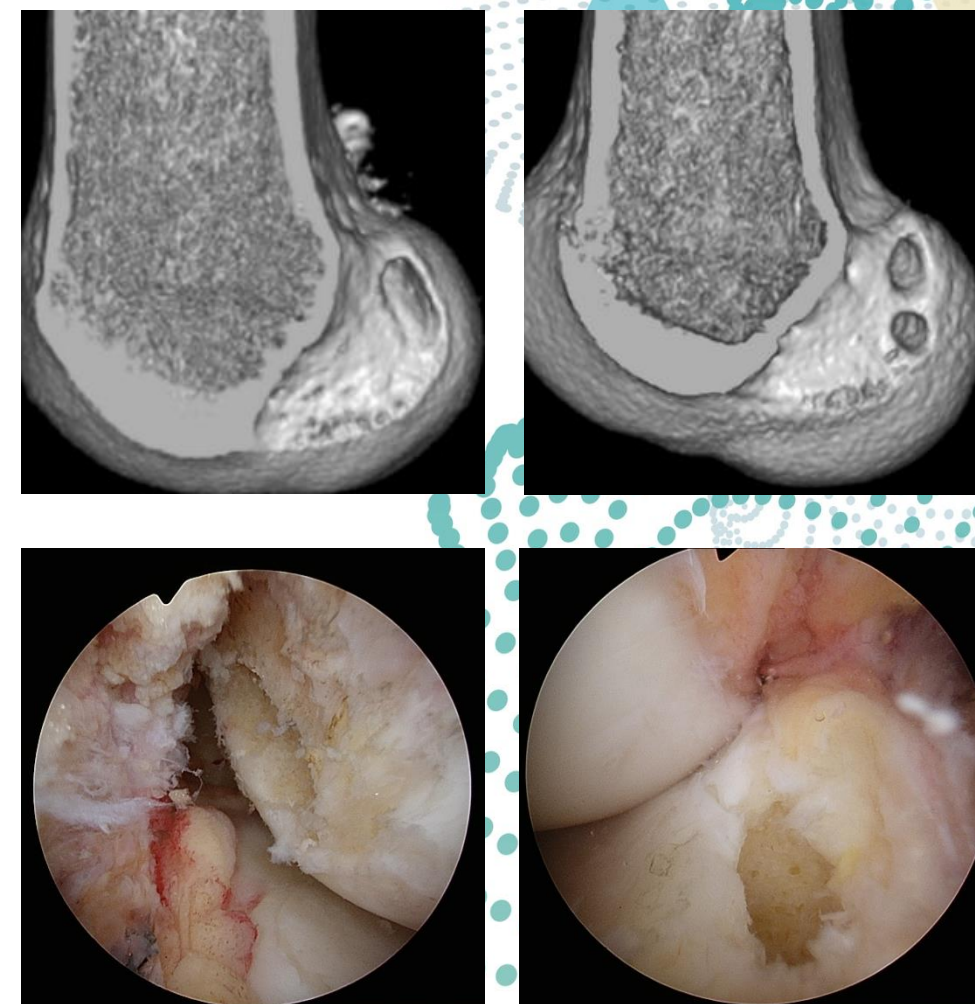
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Materials and Methods

- ✓ Primary anatomical ACLR at our institution
- ✓ Postoperative MRI 2 years after surgery
- 208 patients (98 females and 110 males)

Surgical procedure [5]

- ✓ Bone-patellar tendon-bone (BTB) : rectangular tunnel
- ✓ Hamstrings tendon (HT) : double-bundle
- ✓ Transportal method for femoral tunnel drilling
- ✓ Femoral fixation : Endobutton (Smith & Nephew)
- ✓ Tibial fixation : Double-spike plate small (Smith & Nephew)



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Radiographic evaluation

ATS measurement [6]



MRI (1.5T or 3.0T)
Proton density
imaging

Medial and lateral
ATS were recorded



Clinical evaluation

Covariates

- ✓ Demographic data: Sex, age, BMI, time to surgery (within 3 months [acute] vs. beyond 3 months [chronic])
- ✓ Surgical findings: graft material, meniscus status, treatment for meniscus
- ✓ Radiographic data: PTS, pre- and postoperative ATS

Statistical analysis

- ✓ Pearson's correlation coefficient

Correlation between postoperative ATS and outcome measures

- ✓ Multivariate regression analysis

Independent risk factors among patients' demographic data and parameters that correlated with the postoperative ATS



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Results (ATS)

Medial



Lateral

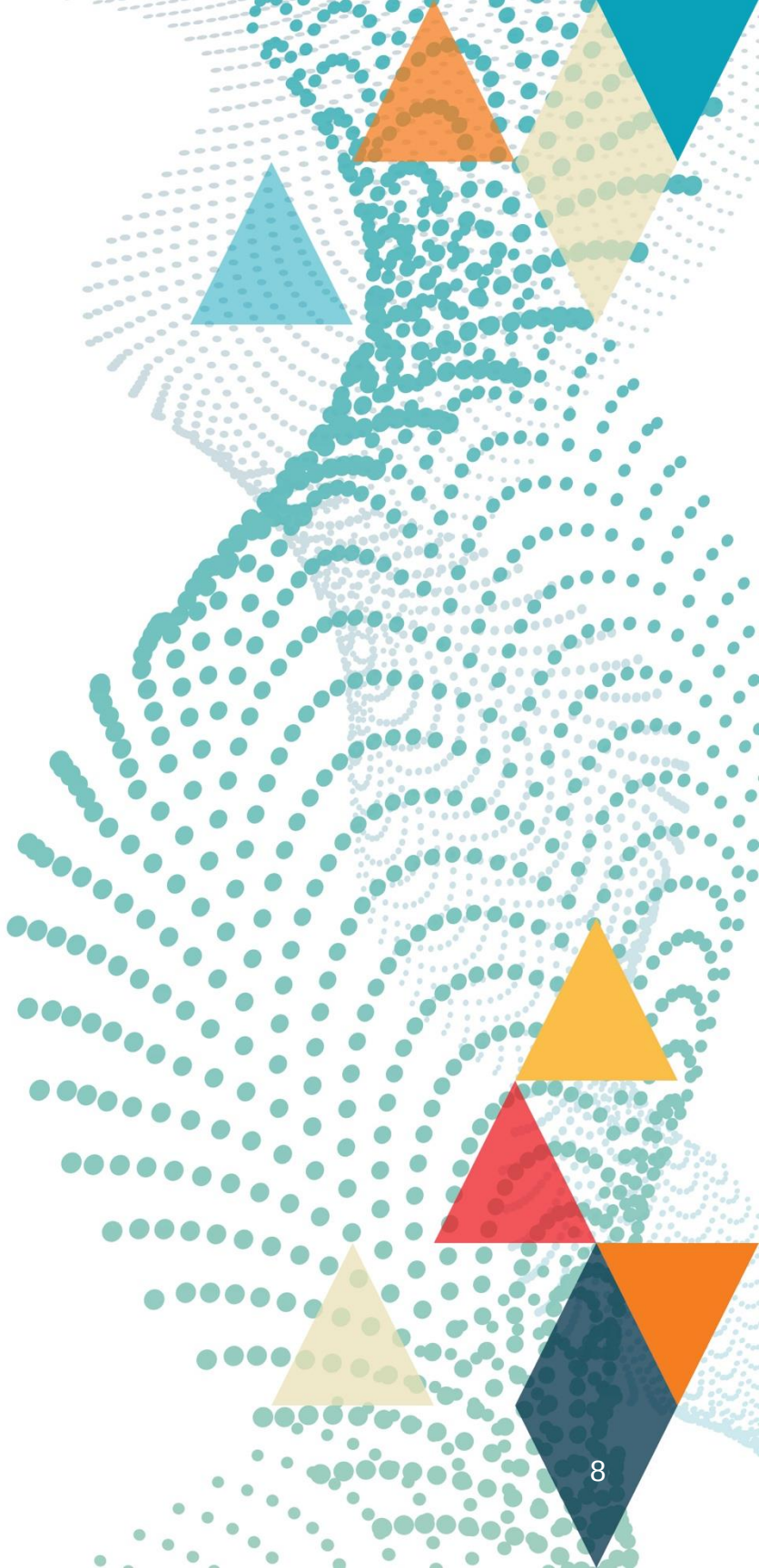


Pre 0.8 ± 2.9 mm

Post 0.9 ± 2.2 mm

2.8 ± 4.0 mm

3.3 ± 3.2 mm



Correlation analysis

		Value	Postoperative medial ATS		Postoperative lateral ATS	
			r	P value	r	P value
Sex (Male / Female)		110/98	−0.21	**< 0.01	0.16	*0.02
Age (years)		30.3 ± 12.6	−0.01	0.91	−0.05	0.47
BMI (kg/m ²)		23.5 ± 3.7	−0.22	**< 0.01	0.02	0.80
Posterior tibial slope (°)	Medial	8.1 ± 3.0	−0.15	*0.04	0.01	0.91
	Lateral	8.0 ± 3.4	−0.03	0.71	0.1	0.15
Time to surgery (Chronic / Acute)		110/96	0.24	**< 0.01	0.18	**< 0.01
Preoperative medial ATS (mm)		0.8 ± 2.9	0.54	**< 0.01	0.27	**< 0.01
Preoperative lateral ATS (mm)		2.8 ± 4.0	0.21	**< 0.01	0.41	**< 0.01
Graft type (HT / BPTB)		38/170	0.05	0.46	−0.20	**< 0.01
MM tear	+ / −	75/133	0.25	**< 0.01	0.06	0.42
	Resection / Suture	22/53	−0.02	0.86	0.06	0.63
LM tear	+ / −	70/138	0	0.89	−0.03	0.66
	Resection / Suture	16/54	0.06	0.63	0.19	0.13
Cartilage lesion (+ / −)		50/158	0.15	*0.04	−0.02	0.75



Multivariate regression analysis (postoperative medial ATS)

	Estimate	Standard Error	95% CI	<i>P</i> value
Sex (Male vs Female)	−0.781	0.290	(−1.353, −0.210)	**0.008
Age	−0.018	0.011	(−0.039, 0.003)	0.088
BMI	−0.067	0.038	(−0.142, 0.009)	0.085
Time to surgery (Chronic vs Acute)	0.603	0.290	(0.031, 1.175)	*0.039
MM tear (+ / −)	0.577	0.300	(−0.016, 1.169)	0.056
Cartilage lesion (+ / −)	0.265	0.319	(−0.364, 0.894)	0.406
Preoperative medial ATS	0.378	0.044	(0.291, 0.464)	**< 0.001
Preoperative lateral ATS	−0.014	0.036	(−0.086, 0.057)	0.694
Medial PTS	−0.072	0.041	(−0.154, 0.008)	0.077



Multivariate regression analysis (postoperative lateral ATS)

	Estimate	Standard Error	95% CI	<i>P</i> value
Sex (Male vs Female)	0.372	0.485	(−0.584, 1.329)	0.443
Age	−0.003	0.018	(−0.038, 0.031)	0.851
BMI	0.022	0.063	(−0.102, 0.146)	0.723
Time to surgery (Chronic vs Acute)	0.919	0.437	(0.056, 1.782)	*0.037
Graft type (HT vs BPTB)	−0.046	0.735	(−1.496, 1.404)	0.950
Preoperative medial ATS	0.013	0.082	(−0.148, 0.175)	0.870
Preoperative lateral ATS	0.293	0.055	(0.184, 0.401)	**< 0.001

Discussion

Correlation with chronic ACL deficiency

Soft-tissue abnormalities cannot be restored even after ACL reconstruction [7]

Correlation with preoperative ATS

This has been supported by previous studies [8,9]

Conclusions

Female sex, chronic ACL deficiency, and preoperative medial ATS were considered predictive factors of postoperative medial ATS.

Chronic ACL deficiency and preoperative lateral ATS were considered predictive factors of the postoperative lateral ATS.



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