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Anterior Cruciate Ligament Remnant in Anterior Cruciate Ligament Reconstruction Surgery: Intra-operative Classification and Effects on Clinical Outcomes.

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INTRODUCTION

- The potential benefits of preserving the tibial remnant during anterior cruciate ligament reconstruction (ACLR) have been investigated previously, but the effect of the length and the tissue quality of the preserved ACL remnant remains unclear.

- Additionally, no reliable method for classification of the tibial ACL remnant has not yet been described.

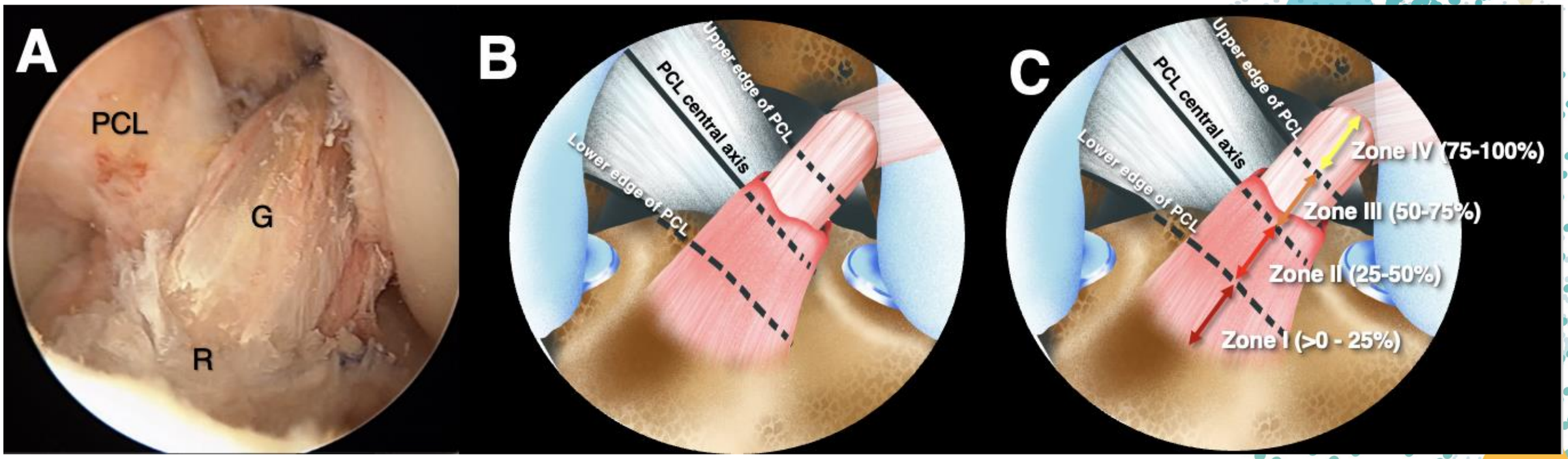
INTRODUCTION

The purpose of this study is developing a method for intra-operative classification of ACL remnant. Assess the effect on clinical outcomes and complications of preserving ACL remnant in ACLR cases.

MATERIALS & METHODS

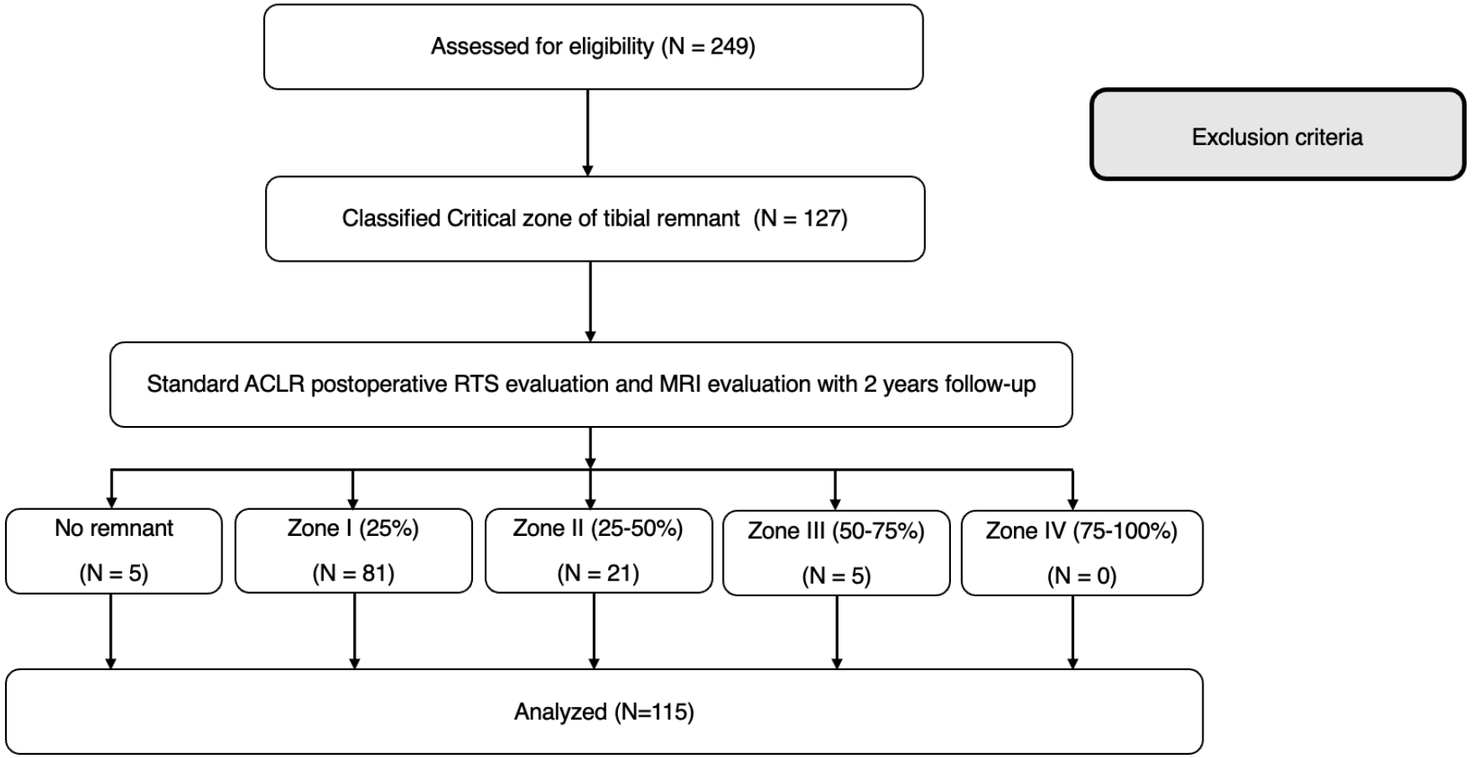
- Arthroscopic video recordings of 115 cases were retrospectively analysed to assess the length of the tibial ACL remnant.
- Retrospective study
- All cases were performed by a single surgeon, between January 2016 and December 2021.

MATERIALS & METHODS



Four zones of ACL tibial remnant assessment (evaluated with knee in 90° flexion, viewed through anterolateral portal)

MATERIALS & METHODS



- The length of the tibial ACL remnant was assessed in a standardized way by 2 different surgeons, and stratified into 5 categories:

RESULTS

			Critical zone of ACL remnant				
		No remnant (n=8)	Zone I (n=81)	Zone II (n=21)	Zone III (n= 5)	Zone IV (n=0)	P-value
Age (yr)		31.62 ± 11.76	27.61 ± 10.08	27.9 ± 9.15	29.4 ± 5.32	-	0.73
Gender	male	6	41	10	2	-	0.54
	female	2	40	11	3	-	
weight (kg)		74.13 ± 9.86	75.48 ± 14.21	74.12 ± 12.78	62 ± 9.41	-	0.21
height (cm)		177 ± 8.5	172.37 ± 9.03	171.88 ± 8.99	169.4 ± 8.56	-	0.44
BMI		23.88 ± 2.85	25.35 ± 3.55	25.12 ± 3.84	21.4 ± 1.52	-	0.08
Affected side	Right	5	40	14	1	-	0.22
	Left	3	41	7	4	-	
Duration (months)		2.43 ± 1.51	1.72 ± 2.18	2.7 ± 5.52	1.4 ± 0.89	-	0.6
Follow-up timing (months)		54.13 ± 16.25	59.09 ± 16.49	53.71 ± 16.05	58.4 ± 18.08	-	0.26
ROM	flexion	125.63 ± 17.41	110.11 ± 23.02	110.41 ± 25.76	103 ± 18.57	-	0.27
	extension	4.13 ± 10.84	7.4 ± 9.6	5.29 ± 6.63	8.8 ± 8.41	-	0.65
GNRB side difference (preop)		3 ± 2.12	3.52 ± 1.95	3.26 ± 1.42	2.05 ± 1.34	-	0.74
functional score (preop)	IKDC	52.88 ± 20.17	44.39 ± 17.29	44.05 ± 15.92	37.2 ± 10.66	-	0.42
	Tegner activity score	5.5 ± 3.16	3.9 ± 3.03	4.47 ± 2.74	4.6 ± 3.21	-	0.49
	Lysholm score	70.75 ± 18.2	57.88 ± 20.84	58.47 ± 20.16	42.2 ± 18.39	-	0.11
	RSI-ACL	75.25 ± 16.19	59.56 ± 22.73	62.2 ± 21.38	61 ± 11.25	-	0.28
Meniscus pathology	medial	0	10	2	1	-	0.68
	lateral	0	6	1	1	-	0.56
Meniscus procedure	menisectomy	0	5	2	1	-	0.54
	meniscal repair	0	12	1	1	-	0.4
Tibial tunnel diameter (intraop)		9.14 ± 0.38	9.15 ± 0.72	9 ± 0.69	9.67 ± 0.58	-	0.49
Femoral tunnel diameter (intraop)		8.8 ± 0.84	8.86 ± 0.56	8.73 ± 0.46	9	-	0.83

* Statistically significant (P-value < 0.05)

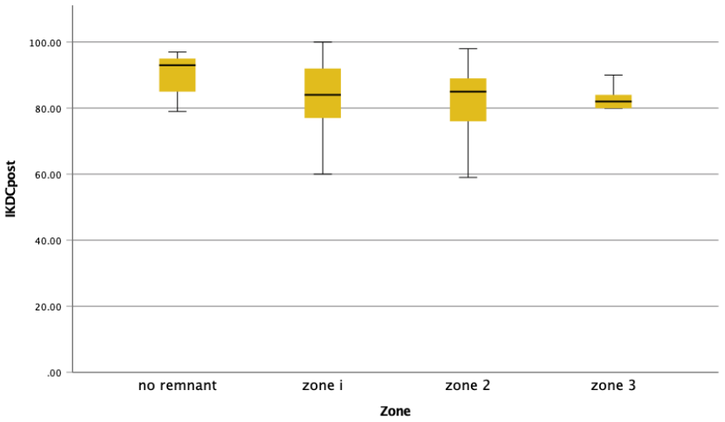
Demographic data

RESULTS

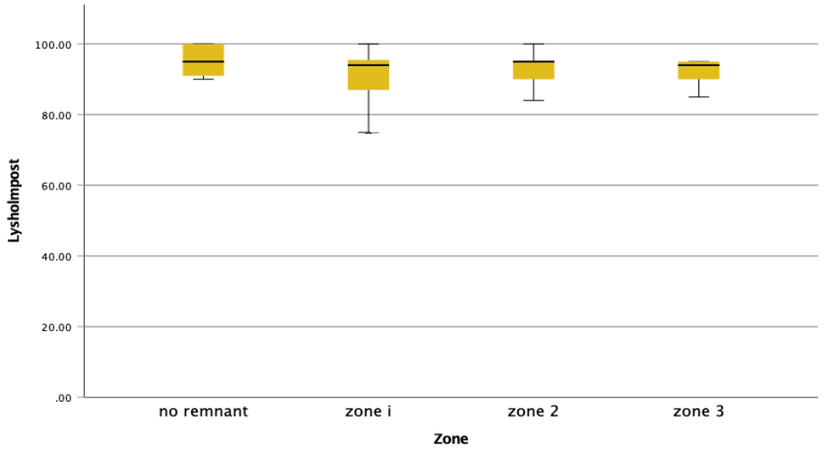
		No remnant (n=8)	Critical zone of ACL remnant				
			Zone I (n=81)	Zone II (n=21)	Zone III (n= 5)	Zone IV (n=0)	P-value
Functional score (Postop)	IKDC	89.8 ± 7.56	83.58±11.71	82.9 ±9.71	81.4 ± 6.91	-	0.6
	Tegner activity score	7.2 ± 2.68	6.34 ± 1.91	6.33 ± 1.65	5.6 ± 0.89	-	0.61
	Lysholm score	95.2 ±4.76	90.46 ± 9.15	93.43 ± 4.61	91.8 ± 4.32	-	0.35
	RSI-ACL	80.5 ±17.82	61.56±24.36	67.76 ±18.37	59 ±9.67	-	0.12
ROM (Postop)	Flexion	132.8 ± 4.09	134.3 ± 6.55	133.56 ± 7.88	135.75 ± 4.35	-	0.89
	Extension	0.8 ± 3.77	-0.3 ± 2.83	1.39 ± 4.13	3.75 ± 9.6	-	0.08
Anterior stabilization (Postop)	GNRB (side to side difference)	1.36 ± 2.14	1.05 ± 2.22	0.11 ± 2.14	0.7 ±0.62	-	0.45
Graft incorporation	NSQ ratio	7.29 ± 4.69	7.36 ± 5.34	7.21 ± 3.32	7.26 ± 6.94	-	1.00
RTS		6/8 (75%)	76/81 (93.83%)	21/21 (100%)	5/5 (100%)	-	0.08
Level of RTS	Lower	1/6	24/76	8/21	1/5	-	0.36
	Same	4/6	40/76	11/21	4/5	-	
	Higher	1/6	12/76	2/21	0	-	

Functional outcomes

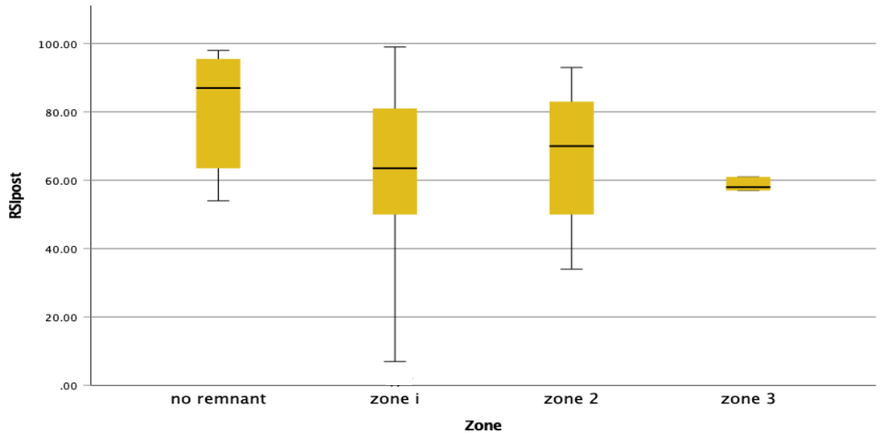
RESULTS



IKDC



Lysholm score



RSI-ACL

- Postoperative functional knee outcomes and complications, there was no significant association between the no remnant group and all critical zones of the remnant preservation groups

RESULTS

		Critical zone of ACL remnant					
		No remnant (n=8)	Zone I (n=81)	Zone II (n=21)	Zone III (n= 5)	Zone IV (n=0)	P-value
Tibial tunnel widening	% Tibial tunnel expansion	32.3 ± 13.77	15.99 ± 8.95	16.98 ± 11.28	12.95 ± 11.79	-	**0.003 ***
Graft ruptured		0/8	3/81	1/21	0/5	-	**0.78**
Revision rate		0/8	7/81	0/21	1/5	-	**0.91**
Cyclops lesion		0/8	3/81	0/21	0/5	-	**0.56**

* Statistically significant (P-value < 0.05)

Complication outcomes

RESULTS

Post hoc analysis (Bonferroni method)

Group comparison		Mean % Tibial tunnel expansion[α]		Mean difference[β]	95% Confidence interval	P-value
First group	Second group	First group	Second group			
No remnant	Zone I	32.2 ± 13.77	15.99 ± 8.95	16.21 (4.3)	4.56 to 27.86	0.002 *
No remnant	Zone II	32.2 ± 13.77	16.98 ± 11.28	15.22 (4.73)	2.39 to 28.05	0.012 *
No remnant	Zone III	32.2 ± 13.77	12.95 ± 11.79	19.25 (7.05)	0.15 to 38.35	0.047 *
Zone I	Zone II	15.99 ± 8.95	16.98 ± 11.28	0.99 (2.78)	-8.54 to 6.56	1.000
Zone I	Zone III	15.99 ± 8.95	12.95 ± 11.79	3.04 (5.92)	-13 to 19.08	1.000
Zone II	Zone III	16.98 ± 11.28	12.95 ± 11.79	4.03 (6.24)	-12.88 to 20.95	1.000

- The remnant preservation group (zones I to III) significantly decreased the tibial tunnel widening when compared with the no remnant group by % tibial tunnel expansion

CONCLUSION

- Tibial remnant preservation (zone I to III) in ACLR significantly reduced tibial tunnel widening.
- This effect was stronger in the subgroup with longer remnants (zone III). No other significantly beneficial effects of remnant preservation were observed.
- There was no increase in the complication rate.

REFERENCE

- Hong L, Li X, Zhang H, et al. Anterior Cruciate Ligament Reconstruction With Remnant Preservation. The American Journal of Sports Medicine. 2012;40(12):2747-2755.
- Liu Y, Li C, Ma N, et al. Proprioceptive and Clinical Outcomes after Remnant Preserved Anterior Cruciate Ligament Reconstruction: Assessment with Minimal Confounding Factors. Orthopaedic Surgery. 2021;14(1):44-54.
- Takazawa Y, Ikeda H, Kawasaki T, et al. ACL Reconstruction Preserving the ACL Remnant Achieves Good Clinical Outcomes and Can Reduce Subsequent Graft Rupture. Orthopaedic Journal of Sports Medicine. 2013;1(4):232596711350507.
- Xie H, Fu Z, Zhong M, et al. Effects of remnant preservation in anterior cruciate ligament reconstruction: A systematic review and meta-analysis. Frontiers in Surgery. 2022;9.
- Webster KE, Jérôme Murgier, Feller JA, Klemm HJ, Devitt BM, Whitehead TA. Preservation of the Tibial Stump During Anterior Cruciate Ligament Reconstruction Surgery Did Not Increase the Rate of Surgery for Symptomatic Cyclops Lesions. Orthopaedic Journal of Sports Medicine. 2021;9(4):232596712199251-232596712199251.