

CHANGE IN CARTILAGE THICKNESS IN THE FEMORO-PATELLAR JOINT AFTER ACUTE ANTERIOR CRUCIATE LIGAMENT TEAR – LONG TERM FOLLOW-UP



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Introduction

Femoro-patellar joint (FPJ) osteoarthritis (OA) is a prevalent disease affecting young and elderly individuals and is recognized as a potent source of knee symptoms. Cartilage thinning of the femoral trochlea within the first two years after an ACL tear was reported using quantitative MR imaging but it is not known whether such changes continue over longer periods.

Objective

To study change in cartilage thickness of the FPJ over the first 2 (BL-2YR), and the subsequent 3 yrs (2YR-5YR) after ACL tear and to explore differences in relation to age, gender, BMI, treatment of the ACL and graft-types used at reconstruction.

Materials

Participants: 107 of 121 KANON-participants had a complete set of MR images at BL, 2 and 5 year follow up (32 women, 26.0±4.9yrs)

Intervention: Out of 107 participants with acute ACL injury 58 were treated with rehabilitation (rehab) + early ACL reconstruction (ACLR), 25 received rehab + delayed ACLR and 24 were treated with rehab alone. From those who received an ACLR (n=83), 44 had hamstrings- and 39 patellatendon-bone autografts.

Cartilage Quantification: Mean cartilage thickness was assessed by manual segmentation of patellar and femoral trochlea cartilage with blinding to time points and treatment groups.

Table 1		Age≤median (n=54)		Age>median (n=53)		Mean Difference	
		Mean /μm	SEM	Mean /μm	SEM	μm	P-value
	Patella	2.33	10.88	-20.41	13.84	80.29	0.022
ACL tear->2yrs	Trochlea	-16.38	14.68	-73.94**	15.95	57.56	0.009
	Patella	14.98	11.34	-22.86	14.36	138.32	0.004
2 -> 5 yrs	Trochlea	8.97	9.25	-11.22	11.32	20.19	0.17
		BMI≤median (n=53)		BMI>median (n=54)		Mean Difference	
		Mean /μm	SEM	Mean /μm	SEM	μm	P-value
	Patella	-12.66	13.51	-5.29	11.47	-7.37	0.678
ACL tear->2yrs	Trochlea	-22.38	16.18	-66.99**	14.86	44.61	0.045
	Patella	-1.48	13.62	-6.01	12.72	4.54	0.808
2 -> 5 yrs	Trochlea	6.65	10.19	-8.57	10.52	15.22	0.301
		Male (n=81)		Female (n=26)		Mean Difference	
		Mean /μm	SEM	Mean /μm	SEM	μm	P-value
	Patella	-14.46	10.38	8.26	16.29	-22.71	0.271
ACL tear->2yrs	Trochlea	-48.50**	13.35	-33.63	19.55	-14.87	0.569
	Patella	-2.99	10.48	-6.20	20.14	3.21	0.883
2 -> 5 yrs	Trochlea	-0.78	8.43	-1.82	15.11	1.04	0.952

Table1: Change in cartilage thickness between BL-2 years and 2-5 years within strata for age, BMI and gender

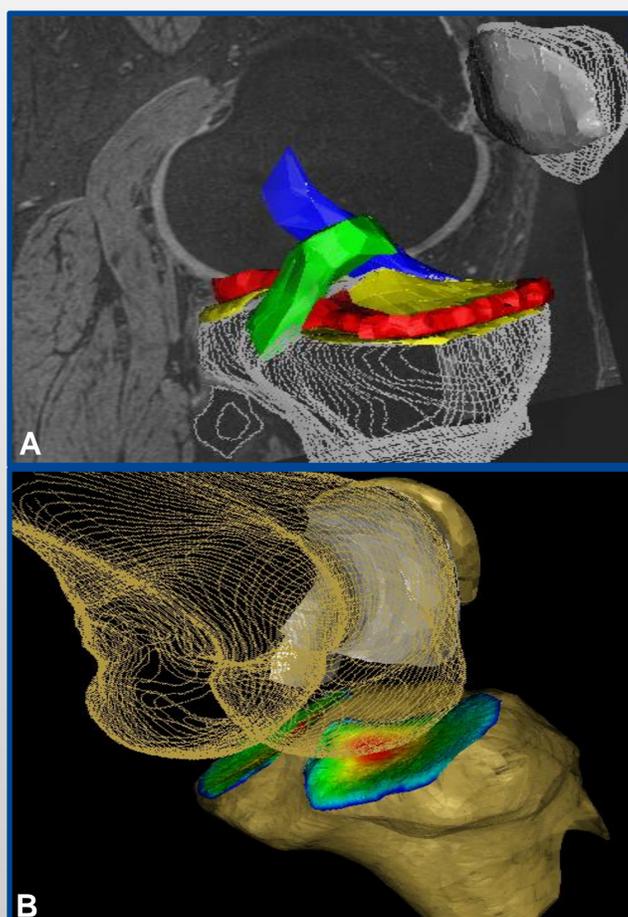


Figure A: 3D-Reconstruction model of the cruciate ligaments (green, blue), menisci (red), tibial cartilage plates (yellow), patellar cartilage (grey) and B: trochlea (white) and tibial subchondral bone plate (multi-color)

Table 2		Mean/μm	SEM	P-value
Rehabilitation alone (n=24)				
	Patella	-3.46	15.33	0.823
ACL tear -> 2 years	Trochlea	-28.83	14.18	0.054
	Patella	8.30	12.99	0.529
2 -> 5 years	Trochlea	11.42	12.04	0.353
Rehabilitation plus early ACL-repair (n=58)				
	Patella	-25.44	13.13	0.058
ACL tear -> 2 years	Trochlea	-62.88	18.27	0.001
	Patella	-12.75	13.08	0.334
2 -> 5 years	Trochlea	-8.98	10.46	0.394
Rehabilitation plus delayed ACL-repair (n=25)				
	Patella	24.10	15.13	0.124
ACL tear -> 2 years	Trochlea	-18.58	15.82	0.252
	Patella	5.51	22.60	0.81
2 -> 5 years	Trochlea	5.46	16.26	0.74

Table2: Change in cartilage thickness between BL-2 years and 2-5 years. Asterisks indicate differences from zero (** p<0.001) within strata for treatment groups

Conclusions

Cartilage loss in the femoral trochlea, but not in the patella, may be an early event occurring within the first 2 years after ACL tear. Older age, but not surgical reconstruction of the injured ACL, seems to increase the risk for such changes.

Results

- Cartilage thickness significantly decreased in the trochlea in older participants (above median age, 25.63yrs, p<0.001) and in participants with a higher BMI (above median, 23.66kg/m², p<0.001, Tbl.1)
- Within the first 2 years older participants (>median age, Tbl.1) lost significantly more cartilage thickness both in the patella (p=0.022) and in the femoral trochlea (p=0.009)
- Between 2-5years, again older participants lost significantly more cartilage thickness (compared to younger participants) in the patella (p=0.004), but not in the trochlea (p=0.17)
- Within the first 2 years (but not 2-5years) in participants with a higher BMI (above median) cartilage thickness significantly decreased in the trochlea (p=0.004), but not in the patella (p=0.68)
- No significant differences in cartilage thickness change were found between the treatment groups (p>0.28) (Tbl. 2)
- No significant differences in cartilage thickness change were found between graft types in those who had ACLR (p>0.63) (Tbl. 2)