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

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Purpose: Patellofemoral joint (PFJ) osteoarthritis (OA) is a prevalent disease affecting young and elderly individuals and is recognized as a potent source of knee symptoms. Using quantitative MR image analysis it was reported that the femoral trochlea undergoes cartilage thinning within the first two years after an ACL tear and that such thinning was more frequent in older individuals. It is however unknown whether these changes continue (and if yes, at which magnitude) over longer follow-up periods. Thus, the purpose of the present work was to study the rate of change in cartilage thickness in the PFJ during the period of 2-5years after ACL tear and to explore differences related to age, gender and BMI.

Methods: 121 young active adults (32 women, 26.0±4.9 years) with an acute ACL tear were included in a randomized control trial (the KANON-trial). The study compared rehabilitation plus early ACL reconstruction (n=62), with rehabilitation plus the option of having delayed ACL reconstruction if needed (n=59). Mean cartilage thickness was assessed by manual segmentation in the patella and femoral trochlea with blinding to time points and treatment groups. Crude and adjusted (age, sex & BMI) statistical testing was performed to explore the magnitude of cartilage loss between baseline (BL, within 4 weeks from ACL tear)-2years and 2-5years in the patella and the femoral trochlea.

Results: 107 of 121 participants had a complete set of MR images at BL, 2 and 5 year follow up. Mean change of cartilage thickness in patella and trochlea was -8.9µm/[-26.4, 8.5] and -44.9µm/[-67.0, -22.8] (mean/[95% CI]) over the first 2 years after ACL tear and -3.8µm/[-22.1, 14.6] and -1.0µm/[-15.6, 13.5] over the period between 2-5 years, respectively. Older patients (above median age, 25.63years) lost significantly more cartilage thickness than younger individuals (below median age) in both the patella (p=0.022) and in the trochlea (p=0.009) over the first 2 years. Similar differences were seen in the patella (p=0.004), but not in the trochlea (p=0.17), between 2-5years (Table 1). Compared to individuals with a lower BMI (below median, 23.66kg/m²), individuals with a higher BMI (above median) had a significant decrease in cartilage thickness of the trochlea over the first 2 years (p=0.045) but not between 2-5years. No corresponding differences related to BMI or gender were observed in the patella (Table 1). In a multi-variate model including age, BMI and gender, older age at ACL tear significantly increased the odds of losing cartilage thickness in the femoral trochlea (OR 1.06, 95% CI 1.01, 1.10) over the first 2 years after tear and in the patella (OR 1.04, 1.00, 1.08) in the period 2-5 years.

Conclusions: These results show that cartilage loss in the femoral trochlea may be an early and temporary event occurring over the first 2 years after ACL tear. In contrast to that, cartilage loss in the patellar cartilage seems to occur later than 2 years after the ACL tear. Older age seems to be a risk factor for these changes. Our results indicate that different

mechanisms may drive loss of cartilage in the femoropatellar joint after ACL tear.
Table 1: Change in cartilage thickness between BL-2 years and 2-5 years. Asterisks indicate differences from zero (** p<0.001) within strata for age, BMI and gender (left side); p-values highlighted in bold indicate significances between these strata (right side).

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		Age<median (n=54)		Age>median (n=53)					
		Mean /µm	SEM	Mean /µm	SEM	Mean Difference /µm	Lower 95% CI	Upper 95% CI	p (2-tailed)
	Patella	2.33	10.88	-20.41	13.84	80.29	11.81	148.78	**0.022**
ACL tear -> 2 years	Trochlea	-16.38	14.68	**-73.94****	15.95	57.56	14.59	100.52	**0.009**
	Patella	14.98	11.34	-22.86	14.36	138.32	43.96	232.68	**0.004**
2 -> 5 years	Trochlea	8.97	9.25	-11.22	11.32	20.19	-8.75	49.13	0.17
		BMI<median (n=53)		BMI>median (n=54)					
		Mean /µm	SEM	Mean /µm	SEM	Mean Difference /µm	Lower 95% CI	Upper 95% CI	p (2-tailed)
	Patella	-12.66	13.51	-5.29	11.47	-7.37	-42.45	27.72	0.678
ACL tear -> 2 years	Trochlea	-22.38	16.18	**-66.99****	14.86	44.61	1.08	88.15	**0.045**
	Patella	-1.48	13.62	-6.01	12.72	4.54	-32.40	41.47	0.808
2 -> 5 years	Trochlea	6.65	10.19	-8.57	10.52	15.22	-13.84	44.27	0.301
		Male (n=81)		Female (n=26)					
		Mean /µm	SEM	Mean /µm	SEM	Mean Difference /µm	Lower 95% CI	Upper 95% CI	p (2-tailed)
	Patella	-14.46	10.38	8.26	16.29	-22.71	-63.41	17.99	0.271
ACL tear -> 2 years	Trochlea	**-48.50****	13.35	-33.63	19.55	-14.87	-66.53	36.79	0.569
	Patella	-2.99	10.48	-6.20	20.14	3.21	-39.86	46.28	0.883
2 -> 5 years	Trochlea	-0.78	8.43	-1.82	15.11	1.04	-33.00	35.08	0.952