

Summary:

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DOES CARTILAGE THICKNESS CHANGE DIFFER BETWEEN ACL DEFICIENT KNEES WITH AND WITHOUT RECONSTRUCTION SURGERY

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Abstract:

Purpose:

An ACL tear is a common knee injury, involving a serious trauma and a subsequent period of chronic alterations in joint biomechanics. The risk of developing incident knee OA after an ACL tear is known to be highly elevated although the driving mechanisms are not known. In this study, we tested the hypothesis that treatment of the initial injury influenced change in femorotibial cartilage thickness over the first five years after injury. We thus explored femorotibial cartilage thickness changes during the first 2 years (BL→Y2) and during a subsequent three-year period (Y2→Y5) after an acute ACL tear.

Methods:

121 young (32 women, mean age 26.1 years) active adults with an acute ACL tear in a previously uninjured knee were included in a treatment RCT (the KANON-trial). Patients were randomized to either rehabilitation plus early ACL reconstruction (ACLR, n=62) or rehabilitation plus the option of having a delayed ACLR if needed (n=59). During the 5 year follow up period, 30 (51%) of those randomized to the latter group had a delayed ACLR. A complete set of sagittal MR images for baseline, 2, and 5 year follow-up was available for 106 participants. Cartilage thickness (ThC) was assessed by manual segmentation of the femorotibial cartilages with blinding to time point and treatment group. Mean change in ThC in the medial femorotibial compartment (MFTC) was considered the primary and subregions with the largest decrease (ordered value 1 = OV1) or increase in ThC (OV16) were considered secondary outcomes. ThC changes were analyzed according using an 'as-treated' approach (57 with early ACLR; 25 with delayed ACLR; 24 with rehabilitation alone) using the t-test (crude differences) and analysis of covariance (differences with adjustment for age, sex & BMI).

Results:

The mean increase of ThC in MFTC between BL→Y2 of knees treated with rehab alone tended to be smaller than in knees treated with early ACLR, but the difference was not statistically significant (crude/adjusted p=0.18 / p=0.16, Table 1). In the same period, the ThC increase in MFTC of knees with delayed ACLR did not differ significantly from increase in knees with early ACLR (crude/adjusted p=0.45 / p=0.31) or knees without ACLR (p=0.68 / p=0.75 for crude/adjusted differences). In the subsequent observation period between Y2→Y5, no significant differences were observed between the three groups (crude/adjusted p>=0.42/0.55).

In the period from BL→Y2, OV 1 was significantly more negative (crude/adjusted p= 0.02/0.02) and OV 16 was significantly more positive (crude/adjusted p= 0.04/0.03) for knees with early ACLR than for knees treated with rehab alone but differences were not significant in the subsequent period from

Y2→Y5 (crude/adjusted p>=0.09/0.14, Table 1). In knees with delayed ACLR both OV 1 and OV 16 tended to have a higher magnitude of change than in knees treated with rehab alone (BL→Y2: p>=0.08/0.09 and Y2→Y5: p>= 0.07/0.04 for crude/adjusted differences). No significant differences were observed for OV1 and OV 16 between knees with delayed and early ACLR (crude/adjusted p>= 0.18/0.23).

Conclusions:

MFTC cartilage thickness increased after acute ACL tear but this increase did not differ significantly between knees treated with (early or delayed) ACLR or knees treated with rehab alone. Our results suggest that an ACLR, performed early or at a later stage, may induce elevated magnitudes of subregional cartilage thickness change. This effect appears to occur during the period immediately after trauma/surgery but not in later periods.

Mean change (MC) and 95% CI (um) in the medial compartment (MFTC), ordered value (OV) 1, and OV 16.					
		Baseline →Year 2		Year 2→Year 5	
		MC	95% CI	MC	95% CI
early ACLR	MFTC	63	[21, 105]	59	[24, 94]
(n=57)	OV 1	-261	[-307, -215]	-167	[-196, -138]
	OV 16	246	[212, 280]	204	[179, 230]
delayed ACLR	MFTC	32	[-45, 110]	85	[30, 140]
(n=25)	OV 1	-239	[-301, -177]	-191	[-253, -129]
	OV 16	230	[174, 285]	235	[198, 272]
no ACLR	MFTC	13	[-45, 70]	82	[28, 135]
(n=24)	OV 1	-174	[-214, -134]	-122	[-167, -78]
	OV 16	183	[138, 229]	186	[147, 225]

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