Comparison of Predisposing Factors Between Anterior Knee Pain on Walking and Anterior Knee Pain at Rest in Patients with Knee Osteoarthritis

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INTRODUCTION: The purpose of this study was to evaluate the differences of predisposing factors between anterior knee pain (AKP) on walking and AKP at rest in symptomatic knee osteoarthritis (KOA) patients with a special focus on infrapatellar fat pad (IPFP) factors. Our hypothesis was that predisposing factors were different between AKP on walking and AKP at rest.

METHODS: A total of 97 patients aged 46-86 years with KOA (Kellgren and Lawrence [KL] grade ≥ 2) were collected. Ethical approval was obtained from the institutional committee of our university. Patients with KL grade of patellofemoral (PF) joint ≥ 3 were excluded to minimize the effect of PF joint OA. IPFP elasticity was evaluated by shear wave speed on elastography. The patients were divided into two groups according to the presence or absence of AKP. Univariate analyses among the two groups were performed about age, sex, femorotibial KL grade, Hoffa score, effusion synovitis score, bone marrow lesion score, IPFP size, shear wave speed, and pressure pain threshold (PPT) by using Fisher's exact test and Mann-Whitney U test. The logistic regression analysis was conducted the factors with a p-value of 0.2 or less in univariate analyses as explanatory variables in the two types of AKP. These analyses were performed for both AKP on walking and AKP at rest and compared the differences of factors.

RESULTS SECTION: Forty-one patients (42.3%) had AKP on walking and 24 patients (24.7%) had AKP at rest. In the univariate analyses, shear wave speed and PPT were significantly associated with AKP on walking (Table 1), and PPT was associated with AKP at rest (Table 2). Logistic regression analysis showed that shear wave speed was the only significant factor for AKP on walking (odds ratio 46.33, p =0.028). By contrast, PPT was the only significant factor for AKP at rest (odds ratio 0.99, p=0.002).

DISCUSSION: This is the first study to evaluate the differences of predisposing factors between the two types of AKP. KOA patients with AKP on walking had more elastic IPFP, which indicated that structural factor was involved in the mechanism. By contrast, AKP at rest was associated with PPT, hyperalgesia possibly contributed the mechanism.

SIGNIFICANCE/CLINICAL RELEVANCE: Predisposing factors were different between AKP on walking and AKP at rest, indicating that the different pain mechanisms exist in the two types of AKP.

<Table 1> Univariate analyses for predisposing factors affecting anterior knee pain on walking (n = 97)

Parameter			AKP on walking		
			Positive (n=41)	Negative (n=56)	P-value
Demographic data	Age (years), mean (SD)		71.3 (10.5)	71.9 (7.1)	0.818
	Female sex		35	38	0.059
Radiograph	KL grade of FT joint	2	7	14	0.233
		3	13	23	
		4	21	19	
MRI	Hoffa score	0	0	2	0.270
		1	28	37	
		2	11	17	
		3	2	0	
	Effusion synovitis score	0	2	8	0.298
		1	19	29	
		2	19	18	
		3	1	1	
	BML score, mean (SD)		7.0 (4.7)	5.1 (3.9)	0.060
	IPFP size (cm³/kg), mean (SD)		0.33 (0.07)	0.36 (0.08)	0.078
Elastography	Shear wave speed(m/s), mean (SD)		1.45 (0.19)	1.34 (0.14)	0.007
PPT	PPT, mean (SD)		419 (146)	499 (145)	0.006

<Table 2> Univariate analyses for predisposing factors affecting anterior knee pain at rest (n = 97)

Parameter			AKP at rest		
			Positive (n=24)	Negative (n=73)	P-value
Demographic data	Age (years), mean (SD)		69.5 (10.3)	72.4 (8.1)	0.236
	Female sex		21	52	0.172
Radiograph	KL grade of FT joint	2	5	16	0.953
		3	8	28	
		4	11	29	
MRI	Hoffa score	0	0	2	0.824
		1	16	49	
		2	7	21	
		3	1	1	
	Effusion synovitis score	0	1	9	0.440
		1	11	37	
		2	12	25	
		3	0	2	
	BML score, mean (SD)		6.5 (5.3)	5.7 (4.0)	0.290
	IPFP size (cm³/kg), mean (SD)		0.33 (0.09)	0.35 (0.07)	0.191
Elastography	Shear wave speed(m/s), mean (SD)		1.43 (0.19)	1.37 (0.16)	0.324
PPT	PPT, mean (SD)		370 (114)	497 (147)	<0.001

<Table 3> Logistic Regression analyses for predisposing factors affecting anterior knee pain (n = 97)

AKP on walking

Parameter	OR	95% CI	P-value
Sex	1.61	0.49-5.30	0.431
BML score	1.02	0.90-1.16	0.714
IPFP size	0.02	0.00-17.08	0.266
Shear wave speed	46.33	1.50-1428.40	0.028
PPT	1.00	0.99-1.00	0.170

AKP at rest

Parameter	OR	95% CI	P-value
Sex	1.38	0.30-6.27	0.676
IPFP size	0.82	0.00-634.16	0.953
PPT	0.99	0.99-1.00	0.002