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The association between self-reported low back pain and radiographic lumbar disc degeneration of the Cohort Hip and Cohort Knee (CHECK) Study

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Abstract

Study design. Cross-sectional study, nested in a prospective cohort (Cohort Hip and Knee, CHECK).

*Objective.*Low back pain (LBP) is very common and the main cause of activity limitations and work absence throughout the world. Although lumbar disc degeneration (LDD) is suggested as a cause of LBP, this association remains debatable. Therefore, this study assessed the association between the radiographic features of LDD and the presence of self-reported LBP, LBP persisting longer than three months, the perceived severity of LBP and presence of neuropathic pain.

Summary of Background Data. Previous literature suggest an association between LBP and both the LDD definitions osteophytes and disc space narrowing. There are no studies that have explored the association between LDD and neuropathic pain.

Methods. Associations between the radiographic LDD using two definitions (i.e. osteophytes, disc space narrowing) versus the presence of LBP, LBP > 3 months, severe LBP and neuropathic pain,were analyzed with logistic regression models.

Results. A total of 699 participantscompleted the questionnaire and had a lumbar radiograph. Radiographs were scored by two independent observers. Osteophytes were present in 98% of the population and disc space narrowing in 67%. Osteophytes were not significantly associated with LBP (OR=1.2, 95% CI 0.9-1.7).Disc space narrowing was significantly associated with the presence of LBP and neuropathic pain.(OR=1.7, 95% CI=1.2-2.4 and OR 1.7, 95% CI 1.1-2.7, respectively). The presence of a LBPseverity score of ≥4, and LBP persisting >3 months were not significantly associated with the two definitions of LDD.

*Conclusions.*This study shows the presence of an association between disc space narrowing, whereas no association was found between osteophytes and LBP. We are the first to report an association between disc space narrowing and neuropathic pain.

Keywords:low back pain; neuropathic pain; pain severity; questionnaires; spinal radiograph; lumbar disc degeneration; disc space narrowing; osteophytes; bony bridging; radiographic features

Level of Evidence:3

Introduction

Low back pain (LBP) is very common and is the most important musculoskeletal cause of activity limitation and work absence throughout the world[1]. LBP is a major medical and economic problem, since one-third of hospital costs and one-half of the costs of absenteeism and disablement due to musculoskeletal disease are attributable to LBP[2].

Since LBP has a high prevalence in the adult general population (1-month global prevalence 23%) the spine is extensivelystudied[3]. Increasing knowledge on the etiology of LBP, will enable improved prevention and treatment strategies.In 85% of the patients with LBP, no definitive causecan be identifieddue to a weak association between the symptoms and findings on diagnostic imaging[4].

Important features of lumbar disc degeneration (LDD) on a radiograph are osteophytes and the presence of disc space narrowing [5, 6]; however different definitions of LDD are used on the LDD features seen radiographically[6, 7]. The frequency of radiographic LDD features increases with age, and both osteophytes and endplate sclerosis have a high prevalence in individuals without LBP [8].

The association between LDD and LBP is still under discussion[6, 8-12]. In older populations (>50 years) several studies report a significant association between radiographic LDD features and LBP[6, 8, 9, 11]. For example. both De Schepper et al[6] and Kalichman et al[11] reported a strong association between disc space narrowing at 2 or more lumbar spine levels and LBP than with narrowing at only 1 level (OR in both studies 2.4). A recent review of Raastad et al[13] found a significant positive association between disc space narrowing and LBP. In the study of De Schepper et al[6] an association was found between the presence of osteophytes and LBP (OR = 1.5; CI = 1.2-1.9), there are other groups suggesting that the presence of osteophytes is a physiologic result of the aging process[8, 14, 15].

The latestreview of Steffens et al[12] found conflicting evidence for anassociation between LBP and radiographic LDD features, however they state that the limited number, heterogeneity and overall methodological quality of the studies did not allow them to draw definite conclusions.

Thus, we can conclude that no consistent information is available about the association between LBP and the various LDD features seen on a radiograph.

Therefore,this study investigatesthe association betweenthe radiographic features of LDD and self-reportedLBP, LBP>three months, the perceived severity of LBP and the presence of neuropathic pain.

Materials and Methods

Study design

We performed a cross-sectional study in the Cohort Hip and Knee (CHECK) at the 8 year follow-up time point. CHECK is a multi-center cohort study with 1002 participants with pain of the hip and/or the knee, initiated to establish the onset and progression of osteoarthritis. A proportion of the participants also had back pain. This cohort was formed between October 2002 and September 2005. Details on the methodology of CHECK are published elsewhere[16, 17].In summary, general practitioners (GPs) in the Netherlandswere able to refer eligible patients to one of the 10 participating hospitals in the vicinity of their practice.

Participants were also recruited by advertisements and articles in local newspapers and on the website of the Dutch Arthritis Association.Patients were eligible for inclusion when they had pain and/ or stiffness of the knee and/ or hip, were aged 45-65 years, and had not visited the GP in the last 6 months for these symptoms. Exclusion criteria were: any pathological condition that could explain the existing complaints or co-morbidity that did not allow physical evaluation and/or follow-up of at least 10 years, malignancy in the past five years,or inability to understand the Dutch language [16].

After informed consent, baseline measures such as demographic characteristics, outcomes, physical examination and clinical features of the knees and hips were collected. Participants with mild symptoms visited the research center at baseline and at 2, 5, 8 and 10 year of follow-up,whereas participants with more serious symptoms visited the research center each year[17]. At the2, 5, 8 and 10 yearfollow-up time point radiographs of the knee and hip and were performed, at the 8 year follow-up time point a radiograph of the spine was added to the imaging protocol.

Measurements

At 8 year follow-up patientsreceived (in addition to questionnaires for hip and knee complaints) a questionnaire which assessed the presence of LBP, severity of LBP, quality of life, neuropathic pain and health impairment due to osteoarthritis:

- The duration of LBPwas measured in days and categorized in 3 months, 3 months to one year, or longer than 1 year.
- The severity of LBP was measured on an 11-point numeric rating scale (NRS), with 0 representing no pain and 10 representing the worst pain imaginable[18].Detailed scores are 0= no pain, 1-3= mild pain, 4-6= moderate pain and 7-10 = severe pain[19].
- Presence of neuropathic pain[20] was assessed using two questions based on the DN4 (‘Douleur Neuropathique 4 questions)[21]. Neuropathic pain was present when 4 or more symptoms/characteristics were answered with ‘yes’.

The following measurements (part of the usual protocol in the CHECK study) were used for the present study:

- Health-related quality of life. This was measured using the EuroQOL five dimensions (EQ-5D) questionnaire addressing five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension has three levels: no problems, some problems and extreme problems. The utility score was determined using this information, in which 1 represents full health and -0.330 represents severe problems in all five dimensions[22].
- The Western Ontario and McMaster osteoarthritis index (WOMAC) which measures pain, stiffness and physical functioning due to osteoarthritis[23, 24]. The standardized score range is 0-100; 0 indicates the worst possible health status and a score of 100 the best health status.

- The American College of Rheumatology (ACR) criteria were used to establish the clinical presence of osteoarthritis in the hip and knee[25, 26]. These criteria were assessed with a questionnaire about the pain, and a physical examination of hip and knee.

Imaging technique and analysis

At 8 year follow-up a lateral radiograph of the lumbar spine was taken. The radiographs were scored for the two LDD characteristics osteophytes and disc space narrowing[27]. The presence of osteophytes and disc space narrowing was evaluated using the four grades of the Lane atlas[6,[28]], i.e. grade 0= none; grade 1= mild; grade 2= moderate; and grade 3= severe[12].

In the present study, the following radiographic definitions of LDD were applied: disc space narrowing and osteophytes. Disc space narrowing was defined as a grade ≥1 narrowing at two or more levels from L1-2 to L5-S1[6]. Osteophyteswere defined when a grade ≥2osteophyte was present at two or more levels from L1-2 to L5-S1.

Vertebral levels from L1-L2 to L5-S1 were evaluated for the presence of LDD features by two independent observers, blinded for the clinical characteristics of the patients. Prior to assessment of the radiographs, the observers were trained in two sessions by an experienced musculoskeletal radiologist.

Given the low prevalence of some of the radiographic features the interobserver reproducibilitywas determinedwith the Prevalence and Bias Adjusted Kappa (PABAK)[29], rather than regular kappa statistics. Compared to the experienced radiologist, the two observers hadPABAK values of 0.5 and 0.7, respectively, for osteophytes; both observers had 0.7 for disc space narrowing. These values indicatemoderate to substantial agreement.

Statistical analysis

Descriptive statistics were used to describe the characteristics of the included patients. The chi-square test and independent t-test were used to determine significant differences in the variables between the group with self-reported LBP and the group without self-reported back pain.

Multivariable logistic regression analyses were performed to determine the association between the two radiographic LDD definitions and LBP, LBP >3 months,severity of LBP, and neuropathic pain.The associations were also investigated after stratifying for gender, because the prevelance of LDD features differs between men and women.

The association of the radiographic LDD definition lumbar disc space narrowing was also explored with the exclusion of level L5-S1. Level L5-S1 is a difficult and potentially inaccurate level to assesson a lateral lumbar radiograph because of lumbosacral transitional vertebrae (prevalence 18.1%)[30, 31]. Excluding this level in the present analysis was expected to adjust for this difficulty.

In these analyses LBP, LBP >3 months, neuropathic pain and severity of LBPwere considered as dependent dichotomized variables.The analyses were adjusted for body mass index, age and gender because these factors are associated with both LBP and thepresence of radiographic LDD features [6, 32]. For the associations regarding osteophytes,the analyses were also adjusted for the presence of bony bridging; this is a sign of diffuse idiopathic skeletal hyperostosis (DISH)[33, 34]. Because of overlapping clinical symptoms, the presence of bony bridging could influence the association between radiographic LDD and LBP. For the associations between LBP and radiographic LDD, odds ratios (OR) with 95% confidence intervals (CI) arepresented. Statistical analyses were performed using SPSS (IBM, version 21).

Results

Patient characteristics

The CHECK cohort started with 1002 participants at baseline. Eight hundred seventy four patients (87%) participated in the 8-year follow-up measurement. Six hundred ninety-nine out of the 874 participated in the study as thirty patients did not have a lumbar radiograph at 8-year follow up and 145 patients did not complete questionnaires. Finally, 699 (80%) of the 874 participated in the study.

The baseline characteristics of these patientsare presented in Table 1: mean age was 64.3 (SD 5.1) years, 80% were women, and LBP was reported by 462 (66%) patients. Participants who reported LBP in the past year were more frequently unable to work than those who did not report LBP (8% versus 3%, p=0.01).

Patients with self-reported LBP scored significantly worse ($p < 0.01$)on the three WOMAC subscales; the mean standardized score was 72.9 (SD 19.2) in patients reporting LBP versus 84.3 (SD 14.6) in patients without reported LBP.

The prevalence of the radiographic LDD features of the lumbar spine is shown in Table 1. Of the 699 patients, 97% had at least grade 1 osteophytes. Disc space narrowing grade ≥1 was observed in 465 (67%) patients.

Osteophytes of at least grade 1 were present in 99% of the patients with LPB and occurred more frequently than disc space narrowing (71%) (Table 1).

Associations between LBP and radiographic LDD features

Table 2 shows the associations between the radiographic featuresof LDD and LBP. The LDD definition osteophytes was not significantly associated with LBP (OR=1.2, 95% CI 0.9-1.7). However, the presence ofdisc space narrowing grade 1,was associated with LBP (OR=1.8, 95% CI 1.3-2.6), as was the definitionof disc space narrowing (OR=1.7, 95% CI=1.2-2.4) The strength of the association between LBP and disc space narrowing decreased and proved to be non-significantat level L1-L5 (exclusion of level L5-S1), OR=1.4, 95% CI= 0.9-2.1. LBP persisting >3 monthswas reported by415 (59%) of all patients and was not associated with radiographic LDD features (Table 2).

LBP severity

Table 3 shows the association between LBP severity grade ≥4 and the radiographic features of LDD. The presence of an LBP score ≥4 showed no significant association with the LDD definitions based on osteophytes and disc space narrowing.

Neuropathic pain

Of the 462 participants with reported LBP, 97 (20%) reported neuropathic pain. There was an association between disc space narrowing grade I and neuropathic pain (OR 1.7, 95% CI 1.1-2.7). No association was found between osteophytes and neuropathic pain.

Discussion

This study shows an association between the radiographicLDD definition disc space narrowing and LBP.To our knowledge, this is the first study to investigate the association between radiographic LDD and neuropathic pain and to report a positive association.

CHECK is a multi-center cohort study including individualswith pain of the hip and/or the knee, initiated to establish the onset and progression of osteoarthritis in knee and hip. Although, we analyzed a selected population, it is a valuable cohort, because LBPis a frequentlyreported comorbidity of osteoarthritis in knee and hip[35, 36].In our study population, of the 462 patients who reported LBP, 104 (23%) had hip osteoarthritis according to the ACR criteria versus 26 of the 237 patients (11%) without reported LBP ($p < 0.01$). Also a significant difference ($p < 0.01$) was observed between the presence of knee osteoarthritis in patients with reported LBP (62%) and patients without reported LBP (45%).Several studies assessed the prevalence of LBP in groups of patients with osteoarthritis of knee and/or hip. Stupar etal[35] conclude that LBP is a possible predictor of subsequent osteoarthritis related pain in patients with hip osteoarthritis, and Wolf etal[37] conclude that backpain was prevalent (54.6%) in patients with osteoarthritis of the knee. Our findings suggest that patients with LBP more often also have osteoarthritis of the knee and/or hip. However, more research is necessary to confirm and validate these results.

In our population, the high prevalence of osteophytes (98%)was similar that in other radiographic surveys[8, 14] and disc space narrowing also showed a high prevalence (grade ≥1 narrowing in 67% and 'definition narrowing' in 39%). Vining et al.reported a prevalence of 29% for single level narrowing and 30% for multilevel narrowing[7]. However, this marked difference in prevalence mightbe explained by differences between the study populations, i.e.- Vining et al. explored the prevalence of radiographic

findings in a relatively young population(mean age 44.8 years) whose complaints were not specifically related to early knee or hip osteoarthritis.

Pye et al.[8] found a moderate association between back pain and disc space narrowing, with the strength of the association increasing with more severe disc space narrowing; only severe osteophytes (maximum grade= 3) were associated with back pain[8]. In our study we used the LDD definitions disc space narrowing and osteophytes and only found an association between LBP and the definition disc space narrowing.A recent systematic review of Raastad et al.[13]reported a significant moderate positive association between disc space narrowing and LBP (OR= 1.47; 95% CI = 1.36-1.58). Their review compared 28 observational studies (22 community-based, 6 occupation-based) of adults with and without nonspecific LBP. Although the authors found no association between osteophytes and LBP, the included articles applied different methods to determine the presence of disc space narrowing and osteophytes.

The open population study of De Schepper et al.[6] used identical definitions for disc space narrowing and osteophytes and reported an association between LBP and both the LDD definition narrowing (OR 2.2, 95% CI 2.8-2.8) and the LDD definition osteophytes (OR=1.6, 95% CI=1.3-2.0). We found an association between narrowing grade I and neuropathic pain (OR 1.7, 95% CI 1.1-2.7). This association might be explained by the possibility that neuropathic pain is associated with nerve root compression[38]. However, further research is necessary to confirm this association.

Our study population was nested in the Cohort Hip and Knee (CHECK) and analysis were performed at 8 year follow-up. Unfortunately baseline measures did not include a questionnaire about low back pain nor a lumbar radiograph. Thereforewe cannot draw conclusions about the course of LBP and LDD in this 8 year-period of time. To study the course of the association between LBP and LDD in time, another (prospective) study design must be used, then it might become more clear if LBP is the consequence of LDD or the other way around.

Strengths and limitations

This study has several strengths:it used standardized methods forthe assessment of the radiographs and bothobservers were trained by a radiologist experienced in musculoskeletal radiology. Furthermore, validated questionnaires were used to measure clinical symptoms.

This study also has several limitations. First, only lumbar lateral radiographswere available for each participant, implying that the grades of osteophytes and disc space narrowing could be underestimated. Without ananteroposterior lumbar radiograph it is almost impossible to detect the prevalence of a lumbosacral transitional vertebra. Because this could result in detecting an overestimated amount of severe disc space narrowing at theL5-S1 level, we excluded L5-S1 from the analysis. However, this could result in an underestimation of disc space narrowing in the whole lumbar spine.

Second, the quality of the radiographs was not consistent. Thus, with differing radiographic quality between the 10 participating hospitals and a different number of participants from each center, information biasmay arise. However, in our radiographicdataset, no structural poor quality wasobserved for any specific center.

In conclusion, this study demonstrates an association between the radiographic LDD definition ‘disc space narrowing’’ and the presence of LBP. An association was also found between neuropathic pain and the LDD definition ‘disc space narrowing’. More studies are needed to validate these results in a similar population, and to evaluate whether radiographs play an important role in classifying patients with LBP and with neuropathic pain.

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Table 1: Patient characteristics

	All, N=699	LBP, N = 462	No LBP, N = 237	LBP vs no LBP p-value
General characteristics				
Age (year) mean ± SD	64.3 ± 5.1	64.0 ± 5.1	64.8 ± 5.1	0.78
Gender, female (%)	557 (80)	376 (81)	181 (76)	0.12
BMI mean ± SD	26.3 ± 4.1	26.4 ± 4.2	26.0 ±3.8	0.18
Educational level (%)				
Primary school	15 (2)	10 (2)	5 (2)	0.97
Secondary school	492 (70)	340 (74)	152 (64)	0.01*
High professional education	175 (25)	101 (22)	74 (31)	0.01*
Work description (%)				
Payed employement	188 (27)	123 (27)	65 (27)	0.86
Unemployed	9 (1)	6 (1)	3 (1)	0.96
Disabled	42 (6)	36 (8)	6 (3)	0.01*
Voluntarily unemployed [1]	424 (61)	271 (59)	153 (65)	0.16
Euroqol utility score	0.80 ± 0.16	0.77 ± 0.17	0.86 ± 0.12	<0.01*
WOMAC subscales, mean ± SD				
Pain standardized	78.2 ± 18.5	74.8 ± 19.0	85.0 ± 15.4	<0.01*
Stiffness standardized	70.0 ± 23.2	65.7 ± 23.8	78.4 ± 19.4	<0.01*
Physical function standardized	77.1 ± 19.2	73.1 ± 19.9	84.8 ± 14.9	<0.01*
Total standardized	76.7 ± 18.6	72.9 ± 19.2	84.3 ± 14.6	<0.01*
Present hip osteoarthritis ACR (%)	130 (19)	104 (23)	26 (11)	<0.01*
Present knee osteoarthritis ACR (%)	405 (58)	293 (63)	112 (47)	<0.01*
Radiologic hip osteoarthritis (%)	117 (17)	84 (18)	33 (14)	0.20
Radiologic knee osteoarthritis (%)	278 (40)	177 (38)	101 (43)	0.27
THR	33 (5)	19 (4)	14 (6)	0.26
Chronic low back pain 3 months	415 (59)	415 (90)		
Chronic low back pain 12 monhts	357 (51)	357 (77)		
Neuropathic pain	97 (14)	97 (20)		
Disability low back pain	4.7 ± 3.2	4.7 ± 3.2		
Morning stiffness back	299 (43)	299 (65)		
Radiographic features				
Osteophytes L1-S1				
Grade 0 (%)	18 (3)	5 (2)	13 (6)	<0.01*
≥ *Grade 1 (%)*	681 (97)	457 (99)	224 (95)	<0.01*
≥ *Grade 2 (%)*	485 (69)	327 (71)	158 (67)	0.26
Grade 3 (%)	187 (27)	117 (25)	70 (30)	0.23
Definition (%)	332 (48)	222 (48)	110 (46)	0.68
Narrowing L1-S1				
Grade 0 (%)	234 (33)	134 (29)	100 (42)	<0.01*
≥ *Grade 1 (%)*	465 (67)	328 (71)	137 (58)	<0.01*

≥ *Grade 2 (%)*	185 (26)	129 (28)	56 (24)	0.22
Grade 3 (%)	49 (7)	37 (8)	12 (5)	0.15
Definition (%)	274 (39)	200 (43)	74 (31)	<0.01*
Narrowing L1-L5				
Grade 0 (%)	327 (47)	195 (42)	132 (56)	<0.01*
≥ *Grade 1 (%)*	372 (53)	267 (58)	60 (25)	<0.01*
≥ *Grade 2 (%)*	108 (15)	75 (16)	33 (14)	0.42
Grade 3 (%)	11 (2)	8 (2)	3 (1)	0.64
Definition (%)	150 (21)	107 (23)	43 (18)	0.13

LBP, low back pain; BMI, body mass index; Euroqol utility score, computed with EuroQOL five dimensions questionnaire; WOMAC, Western Ontario and McMaster Universities osteoarthritis index.
The data were standardized to a range of values from 0-100, where 0 means the worst possible health status and a score of 100 the best health status; Present hip osteoarthritis is classified by the ACR criteria (both definitions); radiologic hip/knee osteoarthritis, Kellgren and Lawrence grade ≥ 2; THR, total hip replacement. Definition 'osteophytes', a grade ≥2 osteophytes at 2 or more levels from L1/2 to L5/S1; definition 'narrowing L1-S1', a grade ≥1 disc space narrowing at 2 or more levels from L1/2 to L5/S1; definition 'narrowing L1-L5', a grade ≥1 disc space narrowing at 2 or more levels from L1/2 to L4/L5;
[1] Voluntarily unemployed = retirement, housewife/houseman, rentier
*p value <0.05; Missing values range from 0-3.4%.

Table 2: Association LBP and radiographic LDD features

	LBP OR (95% CI)	P-value	LBP >3 months OR	P-value	Neuropathic pain OR	P value
Osteophytes L1-S1						
grade 0	Ref		Ref		Ref	
≥ grade 1	#		#		#	
grade 0/ grade 1	Ref		Ref		Ref	
≥ grade 2	1.3 (0.9-1.9)	0.11	1.6 (0.8-3.0)	0.18	0.8 (0.5-1.4)	0.84
grade 0-2	Ref		Ref		Ref	
grade 3	0.8 (0.5-1.3)	0.41	0.9 (0.4-2.1)	0.91	1.0 (0.6-1.8)	0.99
not meeting definition	Ref		Ref		Ref	
definition	1.2 (0.9-1.7)	0.28	1.4 (0.7-2.8)	0.33	1.0 (0.6-1.7)	0.90
Narrowing L1-S1						
grade 0	Ref		Ref		Ref	
≥ grade 1	1.8 (1.3-2.6)	0.001*	1.5 (0.8-2.9)	0.22	1.5 (0.9-2.5)	0.09
grade 0-1	Ref		Ref		Ref	
≥ grade 2	1.2 (0.8-1.8)	0.28	1.1 (0.5-2.1)	0.87	1.1 (0.7-1.9)	0.58
grade 0-2	Ref		Ref		Ref	
grade 3	1.5 (0.8-2.9)	0.26	#	#	1.6 (0.7-3.3)	0.26
not meeting definition	Ref		Ref		Ref	
definition	1.7 (1.2-2.4)*	0.002*	1.6 (0.8-3.2)	0.14	1.3 (0.9-2.1)	0.20
Narrowing L1-L5						
grade 0	Ref		Ref		Ref	
≥ grade 1	1.7 (1.2-2.4)	0.001*	1.5 (0.8-2.8)	0.18	1.7 (1.1-2.7)	0.02*
grade 0-1	Ref		Ref		Ref	
≥ grade 2	1.2 (0.7-1.8)	0.49	0.9 (0.4-2.0)	0.74	1.1 (0.6-1.9)	0.87
grade 0-2	Ref		Ref		Ref	
grade 3	#	#	#	#	#	#
not meeting definition	Ref		Ref		Ref	
definition	1.4 (0.9-2.1)	0.12	1.5 (0.7-3.4)	0.33	1.1 (0.7-2.0)	0.62

LBP = Low back pain: complaints of the low back in the last month; OR = odds ratio.

Adjustments for age, BMI and gender. LBP, low back pain reported in the last month;
definition 'osteophytes': a grade ≥2 osteophytes at 2 or more levels from L1/2 to L5/S1;
definition 'narrowing', a grade ≥1 disc space narrowing at 2 or more levels from L1/2 to L5/S1;
definition 'both', ‘narrowing’ and ‘osteophytes’ both are positive.
*P value < 0.01; # insufficient power

Table 3: Association LBP grade ≥4/10 (n=256) and radiographic LDD features

	N (%)	OR (95% CI)	P-value
Osteophytes L1-S1			
grade 0	4 (2)	Ref	
≥ grade 1	252 (98)	#	#
grade 0-1	70 (27)	Ref	
≥ grade 2	186 (73)	1.2 (0.8-1.8)	0.46
grade 0-2	190 (74)	Ref	
grade 3	66 (26)	1.1 (0.6-1.8)	0.82
not meeting definition	128 (50)	Ref	
definition	128 (50)	1.1 (0.7-1.7)	0.63
Narrowing L1-S1			
grade 0	71 (28)	Ref	
≥ grade 1	185 (72)	1.0 (0.7-1.6)	0.93
grade 0-1	185 (72)	Ref	
≥ grade 2	71 (28)	0.8 (0.5-1.2)	0.26
grade 0-2	232 (91)	Ref	
grade 3	24 (9)	1.2 (0.6-2.6)	0.56
not meeting definition	142 (55)	Ref	
definition	114 (45)	1.0 (0.7-1.5)	0.94
Narrowing L1-L5			
grade 0	104 (41)	Ref	
≥ grade 1	152 (59)	1.1 (0.7-1.6)	0.64
grade 0-1	212 (83)	Ref	
≥ grade 2	44 (17)	1.0 (0.6-1.6)	0.86
grade 0-2	251 (98)	Ref	
≥ grade 3	5 (2)	#	#
not meeting definition	193 (75)	Ref	
definition	63 (25)	1.1 (0.7-1.8)	0.61

LBP = Low back pain: complaints of the low back in the last month
# insufficient power