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Original Article

Lumbar intervertebral disc space height in disc herniation and degeneration patients aged 20 to 25

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Abstract: As low back pain (LBP) imposes a heavy socioeconomic burden, early detection of pathologic intervertebral disc change in young adults holds clinical relevance. This study assesses the feasibility of using X-ray measurements as a predictive measure of lumbar disc herniation (LDH) and degeneration in young LBP patients. The study was retrospectively conducted in patients aged 20-25 years with L-spine X-ray and MRI results at a spine specializing hospital in Korea. A total 389 cases were analyzed with 198 patients with LDH at L4/5 randomly selected as the experimental group from the electronic medical record (EMR) database, and 191 patients without LDH at L4/5 likewise randomly extracted as the control group. The intervertebral disc space height of L4/5, L5/S1, and the anteroposterior (AP) diameter and anterior height of the L4, L5 vertebral bodies were measured on X-ray, and disc degeneration and LDH on MRI, and various combinations were further investigated to set a cut-off score using receiver operating characteristic (ROC) curves. The distance between the inferior and superior midpoints of the vertebral bodies surrounding the L4/5 intervertebral disc space (b) divided by the AP diameter of the inferior border of the L4 vertebral body (d) displayed the largest effect size in detecting LDH and disc degeneration at L4/5 (effect size =0.52, and 0.64, respectively). The b/d value at L4/5 of 0.346-0.349 showed high sensitivity and specificity of ≥0.6 for LDH and disc degeneration diagnosis at L4/5. These results suggest that vertebral body and intervertebral disc space measurements can be used for screening of structural lumbar disc pathologies in young adults with LBP.

Keywords: Intervertebral disc displacement, intervertebral disc degeneration, X-rays, magnetic resonance imaging, ROC curve

Introduction

Low back pain (LBP) is highly prevalent in adult populations, and the number of studies on the diagnosis, classification, and treatment of LBP is rapidly growing. LBP has been reported to incur pain, sick leaves, considerable social and economic expense [1], and disability in young adults.

Lumbar disc herniation (LDH) is a major cause of LBP [2], and although most cases of acute LBP recover within weeks, 2-50% of patients are at risk of developing chronic pain and disability [3, 4], and these patients account for more than 90% of social costs for back incapacity [5].

LBP in childhood and adolescence is a significant risk factor for LBP as an adult [6-9]. Boos et al. showed that decreased end plate blood supply resulted in degenerative disc changes in children and adolescents which would later lead to more change [10]. Also, although single level involvement is common in LDH in younger populations, multilevel involvement increased with time as demonstrated in long-term follow-ups [11, 12]. Given this background, more efforts should be put toward early detection and treatment of disc pathologies in young populations.

The main objective of this study was to assess the feasibility of using X-rays which are relatively inexpensive and accessible as an initial evaluation method for LDH in LBP patients by measuring disc space and surrounding structures. The authors considered using disc height/vertebral body width ratio as a method that may minimize the confounding effect of other attributes (e.g. height, weight, ethnicity), accordingly electing for single level measurements to pre-

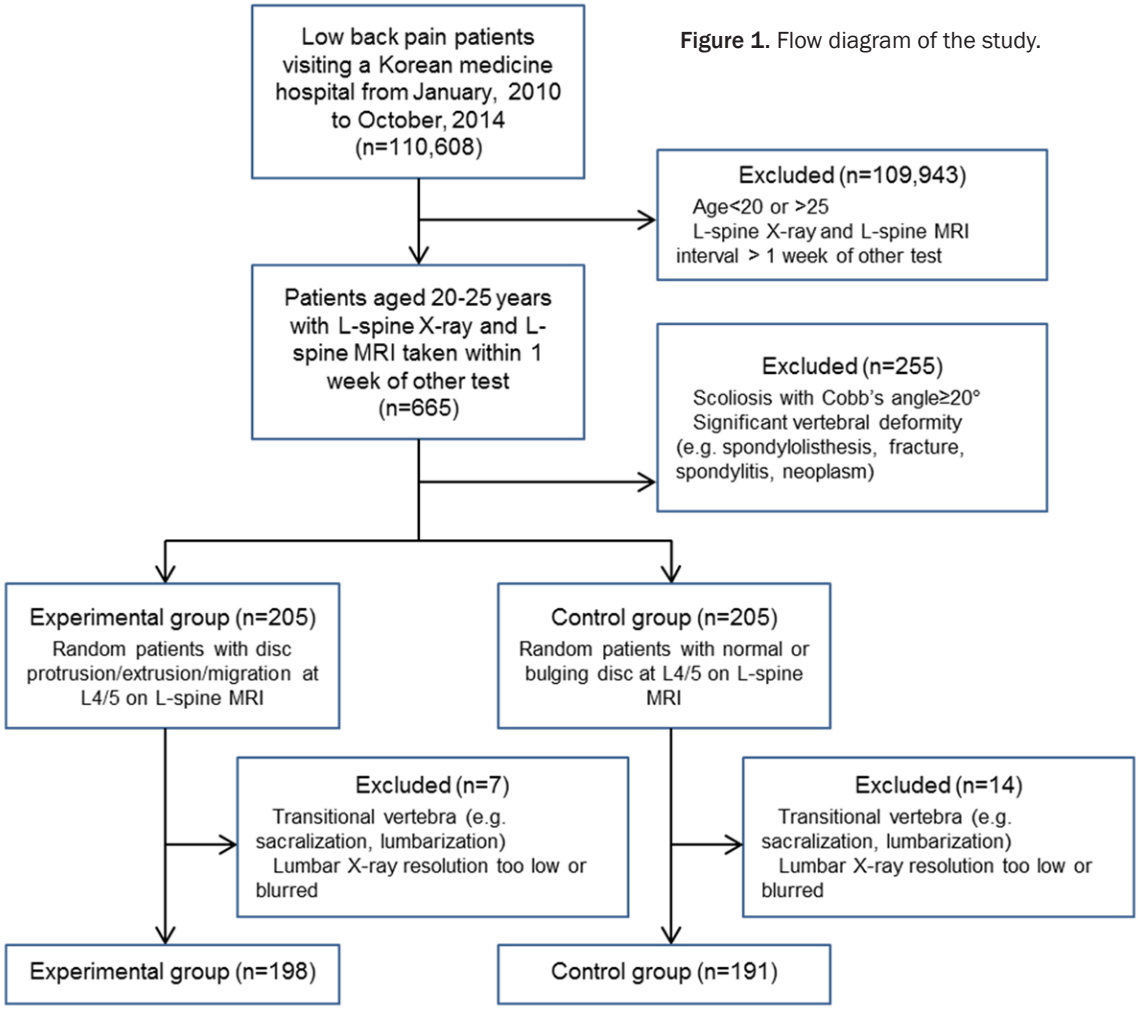

Figure 1. Flow diagram of the study.

clude potential difficulties from neighboring level abnormalities or pathologies, and choosing a young age group (20-25 yrs) as the target population to the aim of minimizing underdiagnosis of disc pathologies as nonspecific LBP.

Material and methods

Participants

The retrospective study was conducted on patients visiting Jaseng Hospital of Korean medicine, a spine specializing Korean medicine hospital designated as such by the Korean Ministry of Health and Welfare, from January, 2010 to October, 2014. A total of 665 patients aged 20-25 years with L-spine X-ray and L-spine MRIs taken within a week of the other test (i.e. time difference between L-spine X-ray and L-spine MRI≤7 days) at this hospital were included as the population pool. Of these patients, 205 patients with radiology specialist L-spine MRI readings of intervertebral disc protrusion, extrusion, or migration at L4/5 were randomly selected as the experimental group, and 205 patients with normal or bulging disc readings at L4/5 randomly extracted as the control group from diagnostic images stored in the electronic medical record (EMR) database.

Participants were limited to native Koreans. Scoliosis patients with a Cobb's angle of ≥20°, significant vertebral deformity of any etiology (e.g. spondylolisthesis, fracture, spondylitis, neoplasm), or spinal surgery history which rendered disc space measurement difficult were excluded (**Figure 1**).

Measurement methods

L-spine X-ray: Lateral L-spine X-rays were taken in the standing position at 95 kVp from a distance of 1 meter with a XDM-M1 (JW Medical Co., Seoul, Korea) model. Infinitt PACS software

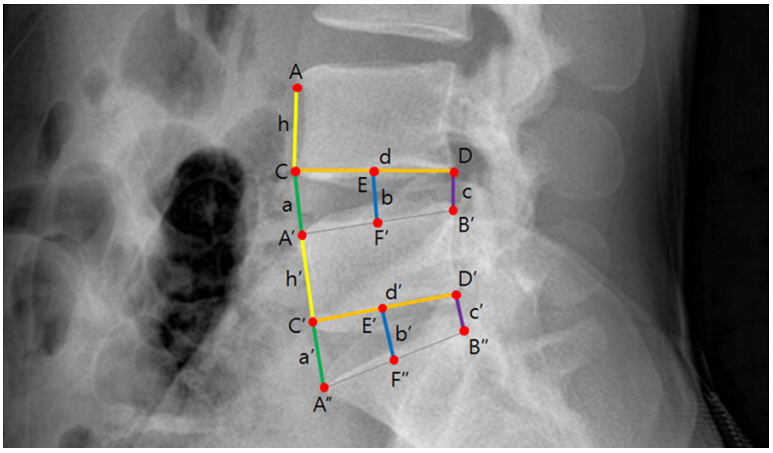

Figure 2. Intervertebral disc space height and vertebral body length and height as measured on lateral L-spine X-ray.

(INFINITT Healthcare Co., Ltd., Seoul, Korea) was used for reading and measurement of the digitized images. The magnification tool was used to scale the lateral L-spine X-ray image to 100%, and window level settings were set at 3,500-4,000 to ensure clear contrast of the vertebral body margins.

The anterior (a), midpoint (b), and posterior (c) height of the intervertebral disc space of L4/5 and L5/S1, anteroposterior (AP) diameter of the inferior (caudal) border (d), and anterior height of the vertebral body (h) of L4 and L5 were measured. Measurement was performed by first marking the 4 vertices (A, B, C, and D) of the L4 and L5 vertebral bodies, the midpoint between C and D (E), and that between A and B (F). The inferior vertebral body margin (d) was set as the distance between the anterior inferior (C) and posterior inferior vertex (D); the vertebral height (h) as between the anterior superior (A) and anterior inferior vertex (C); the anterior intervertebral disc height (a) as between the anterior inferior (C) and anterior superior vertex of the lower adjacent vertebra (A'); the posterior disc height (c) as between the posterior inferior (D) and posterior superior vertex of the lower vertebra (B'); and the midpoint disc height (b) as between the midpoint of the inferior margin AP diameter (E) and that of the superior margin AP diameter of the lower vertebra (F') (**Figure 2**).

The main difficulty we encountered regarding determination of the posterior superior point (B), and this was the initial reason why we opted to measure the inferior vertebral body margin (d). As simple radiographs produce projectional two-dimensional images, the imaging clarity is inferior to MR scanners which create superposition free tomographic cross-sections. There were several cases where the posterior superior vertex (B) could not be defined as a single point from superposition in the L-spine X-ray AP/LAT views with 2-3 projected candidates, and the researchers concurred on use of the most posterior point of the posterior and superior borders through discussion with radiology specialists.

The distance between two points was automatically calculated between the first reference point where the cursor was initially positioned, and the second reference point to where the cursor was dragged and released. All lengths were measured as direct lineal distances.

L-spine MRI: L-spine MR scans were performed using 1.5 Tesla M-1/MR/I magnetic resonance scanners (GE Medical Systems, Milwaukee, WI, USA). The T1, T2-weighted sagittal and axial images were read by 3 radiology specialists, and LDH readings were categorized into normal, bulging, protrusion, extrusion, and migration. We classified cases with normal or bulging disc at L4/5 as the control group, and those with protruded, extruded, or migrated disc material at L4/5 as the experimental group. Disc protrusion is defined as localized (<25% of disc circumference) disc displacement with the corresponding distance of the lateral edges of the displaced portion not greater than the protruded base of the disc of origin; disc extrusion displacement with corresponding distance of the displaced disc material greater than the lateral edges of the extruded base of the disc space of origin or sequestration; and disc migration displacement with extruded disc material shifted away from the extrusion site [13].

Classification of disc degeneration

According to the MRI disc degeneration classification method suggested by Pfirrmann et al. [14], we classified indistinct boundaries betw-

Table 1. Characteristics of patients randomly selected based on lumbar disc herniation status at L4/5 on MRI

	Disc herniation at L4/5			Disc degeneration at L4/5		
	No (n=198)	Yes (n=191)	*P*	No (n=220)	Yes (n=169)	*P*
Age (mean ± SD) (years)	23.0±1.6	23.1±1.6	0.5726	22.9±1.6	23.1±1.6	0.2270
Sex						
Female (%)	105 (51.2)	100 (48.8)	0.9748	115 (56.1)	90 (43.9)	0.9284
Male (%)	93 (50.5)	91 (49.5)		105 (57.1)	79 (42.9)	
LBP						
No (%)	13 (43.3)	17 (56.7)	0.5010	10 (33.3)	20 (66.7)	0.0132
Yes (%)	185 (51.5)	174 (48.5)		210 (58.5)	149 (41.5)	
Radiating leg pain						
No (%)	84 (59.2)	58 (40.8)	0.0181	93 (65.5)	49 (34.5)	0.0096
Yes (%)	114 (46.2)	133 (53.8)		127 (51.4)	120 (48.6)	
Pain radiating below the knee						
No (%)	125 (54.8)	103 (45.2)	0.0819	140 (61.4)	88 (38.6)	0.0284
Yes (%)	73 (45.3)	88 (54.7)		80 (49.7)	81 (50.3)	
Radiating leg pain distribution						
Unilateral (%)	171 (51.8)	159 (48.2)	0.4743	185 (56.1)	145 (43.9)	0.7468
Bilateral (%)	27 (45.8)	32 (54.2)		35 (59.3)	24 (40.7)	
First LBP episode						
No (%)	46 (51.7)	43 (48.3)	0.9616	46 (51.7)	43 (48.3)	0.3505
Yes (%)	152 (50.7)	148 (49.3)		174 (58.0)	126 (42.0)	
Chief complaint						
LBP (%)	192 (50.5)	188 (49.5)	0.5033	217 (57.1)	163 (42.9)	0.1850
Other pain (%)	6 (66.7)	3 (33.3)		3 (33.3)	6 (66.7)	
Distance (mean ± SD) (mm)						
Anterior height of intervertebral disc space at L4/5 (a)[a]	19.2±2.9	18.2±3.1	0.0011	19.1±2.8	18.3±3.3	0.0151
Midpoint height of intervertebral disc space at L4/5 (b)[a]	14.9±2.1	14.3±2.0	0.0048	14.8±2.0	14.3±2.1	0.0092
Posterior height of intervertebral disc space at L4/5 (c)[a]	10.9±2.0	10.8±2.0	0.5251	10.9±2.1	10.7±2.0	0.3962
AP diameter of inferior border of L4 vertebral body (d)[a]	41.4±4.0	42.5±3.8	0.0049	41.1±3.8	43.0±3.9	<.0001
Anterior height of L4 vertebral body (h)[a]	31.0±2.3	30.7±2.4	0.1962	31.2±2.3	30.5±2.3	0.0028

Continuous variables were calculated using t-test, and categorical variables with chi-square test or Fisher's exact test. [a]As depicted in **Figure 2**. MRI: magnetic resonance imaging, LBP: Low back pain, AP: Anteroposterior.

een the nucleus pulposus and annular fibrosis as grade 4, and disruption of the intervertebral disc space as grade 5. Grades 4 and 5 discs were regarded to be degenerated, and those of grades 1, 2, and 3 to be normal.

Outcome assessor blinding and interobserver agreement evaluation

Two Korean medicine specialists blinded to group allocation and clinical data and unaware of the study objectives independently assessed the predefined X-ray distances and levels of disc degeneration on MRI in 105 cases of the control and experimental groups, respectively, following prior consultation with a radiology specialist. The patient X-rays and MRIs were assessed in random order. To assess measurement errors and interobserver agreement, 2 assessors measured the anterior (a), midpoint (b), and posterior (c) height of the intervertebral disc space of L4/5 and L5/S1, the AP diameter of the inferior border (d), anterior height of the vertebral body (h) of L4 and L5, and the level of disc degeneration of 20 validation samples randomly selected from the control and experimental groups. Inter-rater reliability was high with an intraclass correlation coefficient of 0.998 for X-ray measurements, and a kappa coefficient for degeneration classification on MRI of 1.00.

Statistical methods

Continuous variables are expressed as mean ± standard deviation, and categorical variables as frequency and percentage (%). Characteristic differences of LDH and disc degeneration by subgroup were evaluated with t-test or Wilcoxon-rank-sum-test and chi-square test or

Table 2. Comparison of b/d scores (midpoint height of the intervertebral disc space/AP diameter of the inferior vertebral body) by disc herniation status and subgroup type

		N	Mean ± SD	*P*	Effect size
L4/5					
Disc herniation	No	198	0.36±0.05	<.0001	0.52
	Yes	191	0.34±0.04		
Subgroup	Disc protrusion	118	0.34±0.04	0.1143[a]	
	Disc extrusion	47	0.34±0.05		
	Disc migration	26	0.32±0.06		
Disc degeneration	No	220	0.36±0.04	<.0001	0.64
	Yes	169	0.33±0.04		
L5/S1					
Disc herniation	No	223	0.32±0.06	0.2090	0.13
	Yes	160	0.32±0.06		
Subgroup	Disc protrusion	102	0.32±0.06	0.0354[a]	
	Disc extrusion	37	0.31±0.04		
	Disc migration	21	0.29±0.04		
Disc degeneration	No	255	0.33±0.06	0.0053	0.29
	Yes	128	0.31±0.05		

Continuous variables were calculated using t-test. [a]Differences among the 3 lumbar disc herniation subgroups were assessed with one-way analysis of variance (ANOVA) test. AP: Anteroposterior.

Fisher's exact test, and the effect size was calculated for b (midpoint disc height)/d (AP diameter) scores. One-way analysis of variance (ANOVA) test was used to assess differences among the 3 LDH subgroups (protrusion, extrusion, migration), and Tukey's honest significant difference (HSD) test was employed for post-hoc analysis. Inter-rater reliability in continuous variables was calculated with intraclass correlation coefficient, and categorical variables with kappa coefficient. Receiver operating characteristic (ROC) curve and area under the curve (AUC) analysis were performed to assess the diagnostic accuracy of LDH and disc degeneration, and we calculated an optimal cut-off score that would yield maximum sensitivity and specificity.

All data were analyzed with SPSS software version 18.0 (IBM Corporation, NY, USA) and R software version 3.1.1 (R Development Core Team, http://www.r-project.org/), and a significance level of $P<0.05$ was regarded to be statistically significant. Based on preliminary findings from a pilot study at the L4/5 level, to obtain 80% power and detect a difference of 15% at alpha =0.05, 205 cases were needed in each group, requiring a total 410 cases.

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of Jaseng Hospital of Korean Medicine and participants gave written informed consent of medical record use for academic means.

Results

We randomly selected and allocated 205 cases and 205 controls to the experimental group and control group, respectively, from a population pool of 665 patients based on lumbar MRI readings. Of these patients, we additionally excluded cases of minor spinal abnormalities such as transitional vertebra (i.e. sacralization, lumbarization), and cases where lumbar X-ray resolution was too low or blurred. The final number of cases included for measurement was 198 in the experimental group, and 191 in the control group, resulting in a total 389 cases.

The experimental group consisted of LDH cases at L4/5, and with the exception of radiating leg pain, was comparable to the control group in terms of sex, age, pain radiating below the knee, first LBP episode, and chief complaint. The groups differed in all X-ray measurements except posterior disc space height (c). We did not extract additional random samples of disc degeneration at L4/5 or LDH or disc degeneration at L5/S1 from the population for additional analyses, and instead reassessed the 389 cases sampled by LDH status at L4/5 for disc degeneration at L4/5, and LDH and disc degeneration at L5/S1 (**Table 1**).

We calculated the effect sizes by LDH and disc degeneration at L4/5 and L5/S1 for a, b, c, a/h, b/h, c/h, a/d, b/d, c/d, (a+c)/h, (a+c)/d, (a+b+c)/h, and (a+b+c)/d respectively. While there are countless possibilities, complicated combinations with many variables increase risk of error and would also detract from their clini-

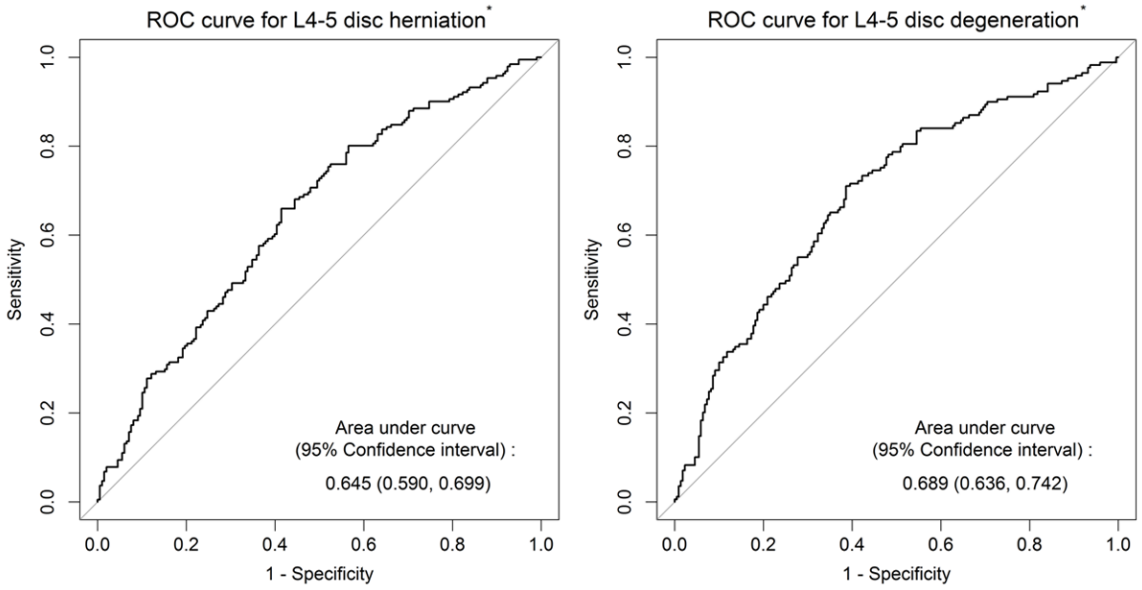

Figure 3. Receiver operating characteristic (ROC) curve of b/d score for disc herniation and disc degeneration at L4/5. *Calculated using the b/d score. b: distance between the 2 midpoints of the inferior and superior borders of the vertebral bodies surrounding the L4/5 intervertebral disc space, d: AP diameter of the inferior border of the L4 vertebral body.

cal appeal. Of these values, a/d, b/d, and (a+c)/d displayed large effect sizes of ≥0.5, and as b/d was largest, we compared groups using b/d.

The b/d value at L4/5 showed large effect sizes (≥0.5) in detecting LDH and disc degeneration status at L4/5 (effect size =0.52, 0.64, respectively). In subgroup analysis, we assessed for differences in b/d by LDH classification, and though b/d was smaller in migration, difference was not statistically significant. Although b/d at L5/S1 could not detect LDH at L5/S1, it was significant for disc degeneration detection at L5/S1 (**Table 2**).

ROC curves were used to evaluate efficiency of b/d at L4/5 for diagnosis of LDH and disc degeneration status at L4/5 (**Figure 3**), and AUCs were 0.645 (95% CI 0.590-0.699) and 0.689 (95% CI 0.636-0.742), respectively. The AUC was 0.595 (95% CI 0.537-0.654) for b/d at L5/S1 in predicting disc degeneration status at L5/S1.

Sensitivity and specificity were assessed to determine the optimal cut-off score for b/d, and the b/d value at L4/5=0.346-0.349 showed high sensitivity and specificity of ≥0.6 for diagnosis of LDH and disc degeneration state at L4/5 (Supplementary Table 1).

Discussion

The objective of this study was to investigate the reliability of using intervertebral disc space measurements as assessed by lumbar X-ray for predicting LDH and disc degeneration on MRI. Of various measurement candidates, the b/d value at L4/5 showed the largest effect size in detecting LDH and disc degeneration at L4/5 and L5/S1, which are the lumbar levels most commonly associated with disc pathologies (effect sizes for LDH at L4/5: 0.52; disc degeneration at L4/5: 0.64; and disc degeneration at L5/S1: 0.29, respectively). A cut-off score of 0.346-0.349 for b/d showed relatively high sensitivity and specificity for disc pathologies at L4/5.

The course of previous studies on disc space narrowing can be largely divided into 2 categories-those regarding the need for diagnostic criteria of disc space narrowing, and those on predictive factors for LDH and disc degeneration. This study could be a long-sought solution for both as the authors have devised a reliable method to objectively calculate disc space narrowing which also has clinical implications. We have suggested clear reference points for standardized measurements, and thus adjusted for inter-individual variability as evidenced by the high inter-rater agreement levels.

The total disc height is generally estimated to be 1/4 of the vertebral column [15]. Considering this high proportion, it is reasonable to presume that disc height is affected by height. Therefore, instead of comparing simple disc height measurements, numerous studies have been conducted using converted measurements based on disc height [16, 17]. The authors adopted this concept and decided on 5 measurements; the anterior, middle, and posterior height of the intervertebral disc space, AP diameter, and anterior height of the vertebral body. An added strength of this method is that it does not involve relative comparisons between neighboring disc levels, allowing independent assessment regardless of surrounding disc problems.

We would like to draw attention to the fact that we set the age limit of the study population at 20-25 years. The authors concurred on the fact that determining predictive factors in younger populations should hold greater significance considering that the main patient population for L-spine MRIs are middle-aged or older, and the reason for selecting the 20-25 year age group was that younger LBP or radiculopathy patients are less likely to be considered for L-spine MRIs due to lower prevalence of disc pathologies, and are thus at greater risk of underdiagnosis. The main objective of this study was to help establish a basic screening criteria to determine whether L-spine MRI examination is necessitated using predictive factors based on L-spine X-ray intervertebral disc space measurements, and there is the added strength of this age group that the confounding effect of physiological aging to the vertebra would be minimal.

The control group consisted of patients with normal or bulging disc at L4/5, and both the control and experimental groups were sampled from LBP patients visiting a Korean medicine hospital for treatment, which may be considered to heighten clinical relevance with regard to early detection of LBP patients at risk of developing chronic conditions and in screening for patients needing further examination. As seen in **Table 1**, many patients with and without LDH presented with radiculopathy, suggesting that the proposed method holds various implications for clinical decision making.

L5/S1 is distinctly different from other lumbar levels in terms of angle. Perhaps for this reason, de Schepper et al. found the strongest association in narrowing and osteophytes at lumbar levels excluding L5/S1 when assessing for associations between disc space narrowing, osteophytes and spondylosis [18], and Pye et al. also limited measurements to L1/2-L4/5, obviating L5/S1 from the start in 2 studies [19, 20]. These study results seem to be similarly affected with p values of 0.209 and 0.0024 for LDH and disc degeneration at L5/S1, respectively. Rather, c/d showed a small effect size =0.21 (P=0.042) for LDH at L5/S1.

Continued attempts have been made to define and classify disc degeneration in a clinically relevant manner [21]. Likewise, continuous work has been conducted to present a clear diagnosis and classification system for disc space narrowing. Lane et al. were first to establish a 4-grade disc degeneration classification system, but the system was limited by low reliability [22]. Mimura et al. introduced a 5-grade classification system based on disc height difference, but did not incorporate specific measurement variables or consider for normal disc height [23]. Videman et al. proposed a 4-grade system that classified disc height compared with the level immediately above [24], and Wang et al. focused efforts on detection of severe narrowing, defining 'severe' as a simplified ≥50% loss of normal height [25]. de Schepper et al. conducted a large-scale population-based study on 1204 men and 1615 women aged ≥55 years to observe the influence of age and disc level in the association between disc degeneration and LBP, and suggested a classification system based on narrowing and osteophyte state [18]. Disc space narrowing at ≥2 levels was more strongly associated with LBP than narrowing at 1 level, and the strength of most associations increased after excluding L5-S1.

Subsequent studies on disc space narrowing have proposed criteria based on single-level measurement variables instead of interlevel comparisons. Difference in end plate length [26], and disc height and length measurement [27] have also been suggested as candidates for detecting disc pathologies. Pappou et al. compared disc height in all lumbar levels on MRI in LBP and LDH groups [28]. Although intra-rater agreement was good (κ=0.7), study limitations included unconfirmed inter-rater agreement and low reliability.

Simple radiographs produce projected two-dimensional images, and imaging clarity is inferior to the tomographic cross-sections of MRIs. Still, the fact that most previous diagnostic imaging studies assessing risk factors for disc pathologies used MRIs could be viewed as a limitation regarding clinical value as a patient with MRI results would have greatly reduced need for predictive imaging. X-rays are usually taken before MRIs, making them a more workable and practical choice for risk assessment. Also, while MRIs are conducted supine, X-rays are generally taken erect, and this difference in loading will consequently affect disc height.

The biggest limitation of this study is probably the racial homogeneity of the study population. As all cases were of native Korean ethnicity, the external validity of these results is weak.

We investigated the feasibility of using plain radiograph measurements in assessing pathological disc change and found them to be significant predictors for LDH and disc degeneration with excellent inter-rater reliability. These results suggest X-rays may be used as a screening test for lumbar disc pathology in young adults with LBP, and enable younger patients at higher risk of under-diagnosis to receive appropriate medical care and prevent progression.

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Disclosure of conflict of interest

None.

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Supplementary Table 1. Sensitivity and specificity of lumbar disc herniation and disc degeneration diagnosis by b/d score (midpoint height of the intervertebral disc space/AP diameter of the inferior vertebral body) cut-off point

Disc herniation at L4/5			Disc degeneration at L4/5			Disc degeneration at L5/S1		
Cut-off score	Sensitivity	Specificity	Cut-off score	Sensitivity	Specificity	Cut-off score	Sensitivity	Specificity
0.327	0.414	0.753	0.327	0.467	0.777	0.291	0.398	0.749
0.329	0.429	0.747	0.329	0.479	0.768	0.294	0.406	0.725
0.332	0.445	0.717	0.332	0.497	0.741	0.298	0.430	0.702
0.335	0.471	0.712	0.335	0.527	0.736	0.301	0.461	0.675
0.338	0.492	0.682	0.33	0.550	0.709	0.30	0.469	0.647
0.340	0.524	0.662	0.340	0.580	0.686	0.308	0.484	0.620
0.343	0.545	0.646	0.343	0.604	0.673	0.311	0.508	0.616
0.346	0.586	0.621	0.346	0.65	0.650	0.315	0.547	0.588
0.349	0.602	0.601	0.349	0.663	0.627	0.317	0.570	0.580
0.351	0.639	0.586	0.351	0.704	0.614	0.318	0.594	0.565
0.354	0.670	0.556	0.354	0.728	0.577	0.322	0.625	0.541
0.357	0.691	0.530	0.357	0.746	0.550	0.325	0.648	0.514
0.360	0.723	0.500	0.360	0.775	0.518	0.329	0.648	0.478
0.362	0.749	0.480	0.362	0.793	0.491	0.332	0.703	0.455
0.365	0.759	0.470	0.365	0.805	0.482	0.336	0.711	0.447
0.368	0.791	0.434	0.368	0.834	0.445	0.339	0.742	0.439
0.371	0.801	0.419	0.371	0.840	0.427	0.342	0.766	0.424
0.373	0.812	0.374	0.373	0.840	0.377	0.346	0.789	0.412
0.379	0.843	0.348	0.379	0.864	0.345	0.353	0.813	0.353
0.382	0.848	0.328	0.382	0.870	0.327	0.356	0.820	0.333

AP: Anteroposterior.