Anatomical Changes of Intervertebral Disc with Age: MRI Study Using Quantitative Measure

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ABSTRACT:

BACKGROUND:

The intervertebral cartilage supports the human body structurally. It absorbs shock and allows movement between adjacent vertebrae1. This framework deteriorates with age, a physiological consequence of the normal aging process.

OBJECTIVE:

To assess alterations that occur between vertebrae of the spinal column from L1 to L5 and to study the changes in vertebral height, occurrence of osteophytes in the lumbar spine vertebrae as well as the prevalence of ligamentum flavum hypertrophy and other signs of degeneration according to the age and sex.

PATIENTS AND METHODS:

The cross sectional study was performed by examining (600) patients suffering from a sharp pain in the lumbar region presented at MRI units at Al-Nuiman Hospital in Baghdad and Ibn Sina teaching Hospital in Mosul .

RESULTS:

The peak age incidence was at the age range of (60-69) years for both degeneration and herniation. Below the age of 40 years, there were 46 patients (7.6%) with degeneration and 22 patients (3.6%) with herniation, while over 40 years the figures were 369 patients (61.5%) showed degeneration and 243 patients (40.5%) with herniation respectively. In addition, there are158 patients have both degeneration and hernia at same time. Out of 600 patients, 371(61.83%) of them are females and 229 (38.17%) are males. The man-to-woman ratio is 1 : 1.6. The vast majority of patients showed degeneration and herniation at L4-L5 level being 367 discs (61.1 %) and 163 patients (27.1 %) out of 600 discs located at that level respectively. Decreased height of the disc increases the potential for fundamental framework changes to the disc, bone and connective tissue.

CONCLUSION:

There is a universal impression that age and sex have an influence on the degeneration of disc of lumber spine

KEYWORDS: herniation; deterioration in lumbar vertebrae; morphological changes; intervertebral disc height

INTRODUCTION:

The intervertebral cartilage gives structural support to the human body. It serves to absorb shock and facilitate movement between adjacent vertebrae[(1)]. With age, this framework undergoes degenerative changes, a physiological consequence of the normal aging process.

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However, a common spinal disorder is part of cellular aging, in which mineral modifications lead to fragility spine over time[(2)].

Several factors may contribute to human loss of spine height[3]. Nutritional deficiency, biological aging of the cell, decreased water level in the spine and alteration of the intercellular polypeptide matrix[4]. Daily life, work-related stress, and eating habits must be taken into account[5]. Degeneration of the lumbar segment with age has anatomical, biomechanical, radiological, biochemical and clinical provisions, so it occurs earlier before any alteration of other connective tissues in the whole body [(6).]

Unfortunately, due to limitations in the healing process, deterioration in the spinal framework is irreversible as the cushions of fibrous tissue (shock-absorbent) between the vertebral body begin to disintegrate. These structural changes can arise either in isolation or in association with other disorders, such as slipped disc[(7)].

The degenerative process begins with the loss of normal curvature, with dehydration, of the spinal fibro cartilage dike. In healthy young vertebrae, water makes up about ninety percent. This percentage does not apply to the elderly, which causes disc thinning[(8)]. The space between the vertebrae shrinks and thus loses its effectiveness as a shock absorber. With the progression of degenerative processes, cracks of various sizes appear in the structure, complicated by the flow of soft gelatinous substance through these cracks, which leads to bulging or rupture of the disc or it may break into pieces. Another addition is the slight bony spurs that grow alongside the edge of the bone. Which may lead to pressure on the vertebrae of the spine or the peripheral spinal nerve which leads to undermining nerve function and causing pain[(9)]. Where the bony osteophytes begin in sequence at the age of twenty and gradually increase with age. In fact, the aging of the spine begins at the beginning of puberty [(10)]. The ligamentum flavum can undergo hypertrophic changes and compression of the spinal canal occurs at any level [(11)]

The anatomical structure of intervertebral fibrocartilage consists of a nucleus pulposus bounded by a fibrous ring that can be weakened over time which rises the percentage of a disc burst and then herniated disc[(12)]. A herniated disc is a disorder in which the content of the disc in between the bones of the spine is damaged, fragmented, and displaced from the canal causing a squeeze on the peripheral spinal nerve Persons between the ages of 35 and 55 are more probable to have a herniated disc which represented as discomfort, numbness, or weakness may be in the waist or leg areas men are twice pretentious as the women[(13)]. The disc prolapse event goes through four stages: bulging, protrusion, extrusion, and isolation of the nucleus pulposus as the final stage. Moreover, MRI of spin showed the anatomical structure of each of the vertebrae, their ligaments, and discs, besides the spinal vertebrae and the spaces between the vertebrae, which are considered a pathway for nerves. Interestingly, degenerative changes in aging processes have typical patterns in MR images "loss of signal intensity, projected of disc material, and decrease in vertebrae height [(14)]

The aim of the study: this revision was conducted to consider the anatomical structural changes resulting from senile degeneration of the fibro cartilaginous joint between lumber spinal vertebrae by MRI machine according to age and sex. To assess the description, magnitude, and abnormalities of bone, and ligaments related to degenerative musculoskeletal disorder in the lumbar disc levels.

PATIENTS AND METHODS:

This cross-sectional study enabled the researchers to study degenerative vertebral disc deterioration as a consequence of aging. And after examining 600 patients suffering from acute pain in the lower back region in an MRI machine at Al-Numan Hospital in Baghdad, and Ibn Sina Teaching Hospital in Mosul, during the period between during the period from January 2021 to and January 2022 were comprehensively screened with MRI technique using the definitive methods for degenerative diseases of the lumbar spine in addition, they were investigated by medical history with a physical examination: muscularity power, weakness, wasting, or discomfort with touch or in response to movement.

Exclusion criteria: included age less than 10 years, whichever spine pathology malignancy, preceding surgery, incomplete or low-quality scan, a history of spinal surgery, scoliosis, Moreover, spondylitis, vertebral osteomyelitis, isthmic slipped vertebra, traumatic lumbar spine are also omitted.

The MRI image was evaluated by a consultant radiologist who is specialized in an MRI reading of the spine. MRI technique used the following methods to classify criteria for assessment of aging deteriorating spine diseases:

The Hurxthal technique defined the disc height in millimeters, the interval between the contrasting endplates at the central of the anterior and the posterior spinal column borders is measured[15]

Modic changes are end plate lesions contiguous to deteriorating dorsal intervertebral fibrocartilage. These changes depended on their attendance on T1—weighted and T2—weighted images[(16)].

MRI is better for looking at soft tissue over bone. So, presence of spondylophytes on either anterior or posterior circumference of the vertebrae were analyzed. A slipped disc is categorized as a bulge that looks like a wide bulge that affects more than twenty-five percent of the disc. If the bulge is wider but still has valuable contact with the disc, it is called a bulge, but when the bulge has slight contact with the actual disc, it is called an extrusion

The appearances or organization of the signal were categorized as third-layered, heterogeneous, attenuated signal. Subsequently, several MRI images of the lumbar region of younger subjects were viewed to establish a basis for a normal disc signal Spinal stenosis was diagnosed by T2-weighted sagittal magnetic resonance imaging. It has been noted that the level of spinal stenosis is either ductal stenosis with preserved cerebrospinal fluid signal or no signal can be detected in absolute spinal stenosis. T2-weighted axial images were measurements of Ligamentum falsum thickness at the vertebral levels. Alterations in disc organization and configuration result in changed intensities perceived on MRI, ordinarily with sagittal and axial T2-weighted images. Furthermore, lumbar disc deterioration seen on MRI is represented as a loss of signal intensity

Technical Specification of MRIs

All cases were examined by 1.5T Siemens (Megnetom Aear- Germany) T2- MRI in sagittal and transverse planes by way of T1=weighted sequences of the sagittal plane. Imaging was based on a thickness of 3 mm per slice. From the cranial to the caudal extension includes at least the L1 to S1 region. The transverse slices were accomplished with specific attention from a morphological view perspective after a radiological analysis.

These scales were taken to assess the image information:

- Absolute and Standardized Disc Height
- spondylosis and dorsal spondylosis present
-variation in the ligamentum flavum
-Sign of disc herniation
- Sign of Spinal stenosis

Statistical Analysis

Descriptive analyzes were performed considering specific variables with numbers and relative frequencies. Continuous values have measured the averages presented in tabular form and compared via t-tests were suitable. Statistical results were analyzed as statistically significant when the P-value was equal to or less than 0.05. Chi-square or fissure Exact test is applied for percentage comparison, with relevant standard deviations (SD) and were appropriate SPSS 20 edition

RESULT:

The study sample consisted of 600 patients, 3000 discs were examined and analyzed. , the age range of the study sample is 45 years.

Age distribution of degeneration and herniation: Table 1 shows the peak age incidence of degeneration and herniation was at six decades, 29.8%and 18.8% out of 600 patients respectively, followed by the second group with high prevalence was in the age range of (50-59) years which showed 23.3% with degeneration and 10.8% of cases with herniation.

The least number of cases presented at the age range of (10 – 19) years, at 0.5 %, and 0.3% having degeneration and herniation respectively.

Gender distribution of the patients: Out of 600 patients, 61.83% of them are females and 38.17% are males, The male to female ratio is 1 : 1.6. Pie chart 1.

Concerning the frequency of degeneration and herniation according to the levels, the majority of patients showed degeneration and herniation at L4-L5 level 61.1 % and 27.1 % out of 600 discs. The next level in decreasing frequency was: "L5:S1, L3:L4, L2:L3" and L1:L2 table 2-A. and Histogram 1.

Further analysis of the results of lumbar slipped disks at L4:L5 level, was 27.16% of which 17.16% were in the female patients, and 10 % were in the men. The woman-to-man ratio is 1.7: 1. This indicates that lumbar disc herniation in the lower lumbar levels affects females more than males.

Specific analysis at the age group 60 – 69, which contains the highest rate of degeneration in the level of L4:L5 with a man-to-woman ratio equal to 1: 1.6 clearly, the ladies are further affected than the men by lumbar disc disintegration at L4:L5 level, tab. 2-B. Fig. 1.

An average of the disc height is assumed in Table 3(A). Intervertebral disc height in all segments of the lumber spine in males is higher than in women. In both genders, the height of disc values makes greater from L1:L2 to L4:L5 and then slightly declined at L5:S1 the cumulative disc height at each intervertebral disc (54.9mm vs. 49.7 mm, p = 0.03); moreover, statistically significant. Tab.3 (B) shows the average disc height increased up to 29 years old. After that, a gradual decrease occurred with increases in age. Average disc height was non-significant between men and women for diverse ages.

According to MRI, the percentage of ligamentum flavum hypertrophy is 38 (6.3 %). Tab. 4-shows changes in Ligamentum falvum thickness, there is a significant increase occurring with age till the maximum at seven decades in the L4:L5 and L5:S1 spinal levels Fig. 2

Table 5 presented a significant rise in signs of bone-related degeneration in entirely age classes. The study revealed that the bony changes, or what is called spondylosis, were more evident in the fifth decade of life. In comparison with dorsal spondylophytes, it rarely occurred even in the elderly. However, spondylosis was present in 47.7%. There was a significant increase with age.

Then, a significant increase occurred concerning the L4:L5 level Fig. 3.

Regarding spinal canal, stenosis is found in 7.6%, Table 6 presented that the 88.7% of narrowed disc plate spaces at the L4:L5 level showed degeneration and 53.4% of the narrowed disc spaces showed herniation; so, there is a strong relationship between disc space narrowing and the existence of degeneration or hernia on MRI examination.

Table (7) indicated that not every narrowed disc space is a degenerated or a herniated disc, neither every degenerated disc nor every herniated disc shows disc space narrowing and still there is strong relationship between them as statistically proven Fig. 4

Regarding the type of lumbar disc prolapse and their distribution according to the level, Table 8 showed that the total number of lumbar discs prolapsed was 21.9% out of 3000 discs which were categorized as bulging discs in 11.46%, and protrusion in 10.46% so bulging disc type is the commonest type of lumbar disc prolapsed Fig 5-6.

RESULTS:

Results of the current study show that schmoler's nodes appeared more frequently in the L2-L3 region. The total number was 163 (5.43%) situated on the superior surface and 115 (3.83%) on the inferior surface of the vertebral body. Schmoler's nodes were more frequently established in the superior surface of the vertebral body (63.7%). Tab. 9 Fig7.

Table 1 : Age distribution of degenerated and herniated discs

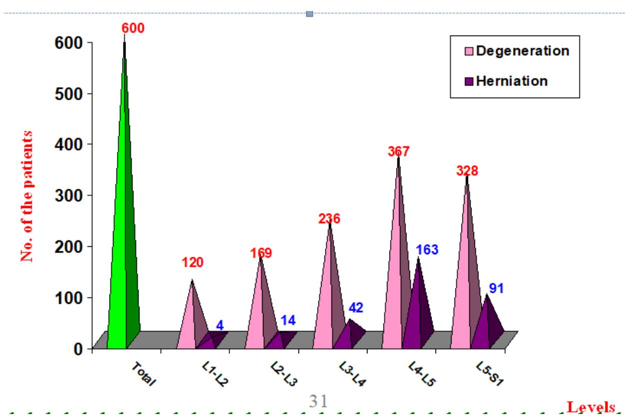
Age range (years)	Degeneration		Herniation		No. and % of patients with lumbar disc herniation below and above 40 years	No. and % of patients with lumbar disc Degeneration below and above 40 years
	No.	% out of 600 patients	No.	% out of 600 patients		
10 – 19	3	0.5	2	0.3	Herniation below 40 years= 22 patient (3.6%)	Degeneration below 40 years=46 patient (7.6%)
20 – 29	7	1.16	2	0.3		
30 – 39	36	6	18	3		
40 – 49	78	13	44	7.3	Herniation above 40 years = 243 patients (40.5%)	Degeneration above 40 years= 369 patients (61.5%)
50 – 59	140	23.33	65	10.8		
60 – 69 *	179	29.83	113	18.8		
70 – 79	41	6.83	17	2.8		
80 – 89	9	1.5	4	0.6		
Total	493	82.15	265	44.16		

* The peak age incidence for both degeneration and herniation is at the age range (60 – 69) years.

Table 2-A : Distribution of degenerated and herniated discs according to the levels.

Disc level	Degeneration			Herniation		
	No.	% out of 600 disc level	% out of 3000 disc	No.	% out of 600 disc level	% out of 3000 disc
L1-L2	120	20	4	4	0.66	0.1
L2-L3	169	28.16	5.63	14	2.33	0.5
L3-L4	236	39.33	7.87	42	7	1.4
L4-L5 *	367	61.16	12.23	163	27.16	5.4
L5-S1	328	54.66	10.93	91	15.16	3
Total	1220		40.66	314		10.4

* L4-L5 is the most commonly affected level by both degeneration and herniation



Histogram 1: Distribution of degenerative structural changes according to the leveS

Table 2- B: Distribution of patients with lumbar degenerative structural changes according to gender.

degenerative stracturalstructural changes at L4-L5		Female		Male	
Total number	% out of 600	No.	% out of 600 patients	No.	% out of 600 patients
163	27.16	103	17.16	60	10
at (60-69)year age group		65	7.5	27	4.5

The female : male ratio = 1.7 : 1

Table 3-A Mean and p values of intervertebral disc heights according to the level.

level	Male Mean±SD	Female Mean±SD	p-value
L1 - L2	9.8±0.72	9.2±0.35	0.19
L2 - L3	11±0.5	10.1±0.74	0.09
L3 - L4	11.9±0.29	10.8±0.52	0.07
L4 - L5	11.7±0.33	10.1±0.55	0.01
L5 - S1	10.5±0.61	9.5±0.4	0.04
Cumulative L1-S1 disc height	54.9	49.7	0.03

P value is Fisher Exact test -two comparison maximum

Table 3-B: Average disc height in male and female , mean ±SD, mm of intervertebral disc heights according to age.

Group	Average Disc Height in male , mean ±SD, mm	Average Disc Height in female, mean ±SD, mm	p-value
10-19	10.97±1.5	8.81±2.26	0.05(s)
20- 29	13.51 ± 0.03	14.19 ± 0.04	0.712(NS)
30 – 39	12.99 ± 0.7	13.39 ± 1.0	0.872(NS)
40 – 49	11.65 ± 0.5	11.74 ± 0.5	0.926(NS)
50 – 59	9.92 ± 0.5	10.12 ± 0.6	0.543(NS)
60 – 69	8.78 ± 0.4	9.657 ±3.08	0.589(NS
70-79	9.59±1,33	9.6±1.5	0. 673(NS)
80-89	6.16 ± 0.02	6.56 ± 0.02	0.963(NS)

NS = Not significant using Chi-square test or Fisher Exact test

Table 4: Thickness of ligamentum flavum at different lumbar spinal levels in different age groups.

Age group	Spinal level	LF thickness(mm)
10-19	L3–L4	2.1
	L4–L5	3.9
	L5–S1	2.7
20-29	L3–L4	2.8
	L4–L5	3.7
	L5–S1	2.7
30 – 39	L3–L4	2.7
	L4–L5	3.5
	L5–S1	2.9
40–49	L3–L4	3.0
	L4–L5	3.8
	L5–S1	2.9
50–59	L3–L4	3.4
	L4–L5	4.1
	L5–S1	3.1
60–69	L3–L4	3.4
	L4–L5	3.8
	L5–S1	3.1
70-79	L3–L4	3.8
	L4–L5	4.2
	L5–S1	2.9
80-89	L3–L4	3.7
	L4–L5	4.3
	L5–S1	3.1

Table 5: List of osseous criteria for segment degeneration (number and proportion of segments with, spondylosis and dorsal spondylosis for each age group).

level	Ventral Spondylophytes									Dorsal spondylophytes						
	Less than 20	20-29	30-39	40-49	50-59	60-69	>70		Less than 20.	20-29	30-39	40-49	50-59	60-69	>70	
L1 – L2	0	1	1	11	19	18	20	<0.001	0	0	0	1	0	1	1	0.729
L2 – L3	0	0	4	11	28	30	33	<0.001	0	0	1	1	4	3	3	0.007
L3 – L4	0	3	12	41	33	35	35	<0.001	0	0	0	4	4	2	2	0.004
L4 – L5	1	4	11	24	36	40	39	<0.001	1	2	3	4	4	7	1	0.156
L5 – S1	0	1	3	23	27	30	55	<0.001	0	0	5	4	4	6	3	0.009
total	1	9	31	110	133	153	182	<0.001	1	2	9	14	16	19	10	0.0165

Tables 6: Relation between disc space narrowing and the presence of degeneration on MRI examination according to the level

Level	Narrowed disc spaces		No. of degenerate disc	%out of 3000 disc	%out of Narrowed spaces	Normal disc spaces		No. of degenerate disc	%out of 3000 disc	%out of Normal spaces	Total degenerate discs	
	No.	%out of 3000 disc				No.	%out of 3000 disc				No.	%out of 600 disc level
L1 - S2	32	1.06	23	0.76	71.87	568	18.93	97	3.23	17.07	120	20
L2 - S3	52	1.73	41	1.36	78.84	548	18.26	129	4.3	23.54	170	28.3
L3 - S4	91	3.03	75	2.5	82.41	509	16.96	160	5.33	31.43	325	39.1
L4 - S5	204	6.8	181	6.03	88.72	396	13.2	186	6.2	46.96	367	61.1
L5 - S1	177	5.9	162	5.4	91.52	423	14.1	166	5.53	39.24	328	54.6
T0tal	556	18.53	482	16.05	86.69	2444	81.46	738	24.6	30.19	1220	40.66

Table 7: Narrowed disc spaces and their relation to the presence of degeneration and herniation on MRI examination.

	Degeneration		Herniation	
	Degenera-ted discs no. and % out of 3000 disc	Normal discs no. and % out of 3000 disc	Herniated discs no. and % out of 3000 disc	Normal discs no. and % out of 3000 disc
Narrowed disc space	482 (16.06%)	74(2.47%)	212 (7.07%)	344 (11.47%)
Normal disc spaces	738 (24.6%)	1706 (56.87%)	102 (3.4%)	2342 (78.06%)
Total	1220 (40.66%)	1780	314 (10.5%)	
	Total degenerated+ remaining normal discs on MRI examination = 3000		Total herniated+ remaining normal discs on MRI examination = 3000	
	Chi-square = 204.6 at P-value = 0.000001 < 0.05 significant		Chi-square = 380.31 at P-value = 0.000002 < 0.05 significant	

Table 8: Types of lumbar disc prolapse and their distribution according to the level.

level	Protruded discs*			Herniated discs			Extruded discs			Migrated discs			Total PD	
	No.	% out of 3000 disc	% out of PD	No.	% out of 3000 disc	% out of PD	No.	% out of 3000 disc	% out of PD	No.	% out of 3000 disc	% out of PD	No.	% out of PD
L1 – L2	17	0.56	2.58	5	0.17	0.75	0	-	-	0	-	-	22	3.34
L2 – L3	20	0.66	3.03	12	0.4	1.82	2	0.07	0.3	0	-	-	34	5.17
L3 – L4	59	1.96	8.96	40	1.33	6.08	2	0.07	0.3	0	-	-	101	15.35
L4 – L5	133	4.43	20.2	143	4.77	21.73	13	0.43	1.98	7	0.23	1.06	296	44.98
L5 – S1	115	3.83	17.5	86	2.87	13.07	3	0.1	0.45	1	0.03	0.15	205	31.16
Over all 2500 discs	344	11.46	52.2	286	9.53	43.46	20	0.67	3.03	8	0.26	1.21	658	100

PD: prolapsed discs*Protruded disc is the most common type

Table 9: Distribution of schmoler's nodes in the superior & in the Inferior surface of lumbar vertebrae.

Lumbar vertebrae	Superior surface of the vertebrae			Inferior surface of the vertebrae		
	No.	% out of 3000 vertebra	% out of 600 vertebra at each level	No.	% out of 3000 vertebra	% out of 600 vertebra at each level
L1	20	0.67	3.3	30	1	5
L2	46	1.53	7.6	41	1.37	6.8
L3	50	1.67	8.3	32	1.06	5.3
L4	43	1.43	7.2	11	0.37	1.8
L5	4	0.13	0.6	1	0.03	0.16
Total	163	5.43		115	3.83	

Fig. 1:. T2/W sagittal image showing loss of signal intensity from the degenerated nucleus in the L3-4 & L4-5

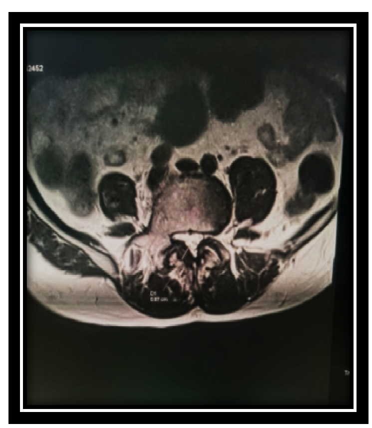


Fig2:T2-weighted MRI axial images at L4-5 IVD level showed ligamentum flavin hypertrophy - height loss

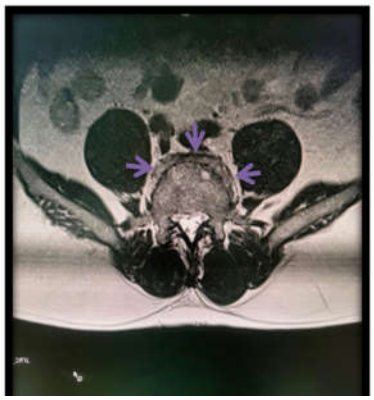


Fig 3:T2-weighted MRI axial images at L4-5 IVD level showed ventral vertebral osteophyte

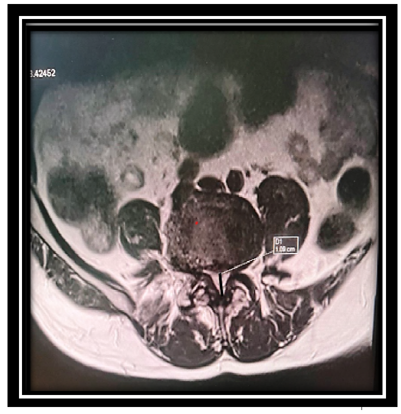


Fig4:T2-weighted MRI axial images at L4-5 IVD level showed spinal canal stenosis

Fig5: T2/W MRI axial image at L4-5 IVD level showed central disc protrusion on background of diffuse disc bulge + acute central annular tear

Fig. 6- T2/W axial MRI image showing central and left posterolateral herniated disc at L4-L5 level with compression on the corresponding neural exit

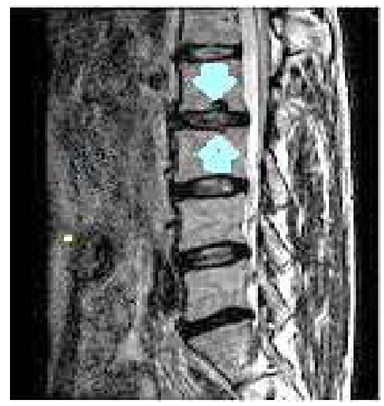


Fig.7- T2-weighted MR image shows Schmorl's node (arrow).

DISCUSSION:

Discomfort in the lumbar region of the spine is the second maximum common complaint in a medical care situation with an annual rate of (15-20%) in America[17]. This study was able to find preliminary indicators for the age distribution of lumbar spine degeneration. It was noted that the deteriorating signs of the spinal column upsurge with age, in addition to the increase in the sections affected by degeneration with age. Wherever, Nather et al, (2022) proved that the same effect on the structural deterioration of the intervertebral disc with age, with a prevalence ranging from 38.8% in the third decade of life to 91.6% in the fifth decade of life[18]. Many researchers assert that intervertebral disc deterioration is a natural consequence of aging and structural changes. They can occur simultaneously, although the decadence mechanism begins in the first decade of life, symptoms of the disease appear in more than 90% of people by the age of 60, For Kjaer et al., 2016, and other researchers demonstrated that men in the fourth to the fifth decade were the most susceptible to structural changes of the lumbar disc[19]. However, Emad, 2017 showed a rate of lumbar disc changes of 1.22% in adolescents and young adults[28]. From what has been shown above, cartilage, fibrous tissue, and water are major components of the discs between the bones of the spine. With age, these discs begin to deteriorate and may compress, bulge, or collapse, causing pain of varying intensity that may interfere with daily activities [20]

Regarding the level of lumbar disc degenerative, most of the studies have agreed that although the aging process of spin takes place in all levels of the backbone, L4:L5 - L5:S1 the most level influence, and they confirmed that structural changes occur in 95% of patients in the L4:5 followed by L5:S1 vertebrae correspondingly because it bears the brunt of body weight. So, it is noted that hernias occur in those vertebrae more than others [(21)]. Rahyussalim et al. found that the most commonly affected levels were the L4:L5 (42%) and subsequently the L3:L4 (29%) [(22)]. Some of the patients do not go to the doctor and do not undergo treatment, because the back pain subsides or disappears within about a month. Similar to the outcome of the current study, herniated discs occur in a large proportion due to aging either in the lower two vertebrae of the lower backbone or the transitional area between the lumbar and the sacral spine in the lower back[(23)]. This is explained by increased loads in the L4:L5 segment and decreased mobility in segments below this level.

In reviewing the result obtained from the current research. It was found that the percentage of total intervertebral disc degeneration was more in women than in males 1.7:1. Moreover, recent studies showed significant variances in the prevalence of the variable disc degenerative structural changes between males and females of different age groups. While some studies have proven to be consistent with the outcome of this research, in other studies [(24)], the opposite was true, in which males It was probable to be four times more infected than women, which supply potential confirmation for gender-related differences[(25-26)]. Is of interest, Abdalkader et al. 2020 reported that women and men were existing equally (50% or 53:105 against 50% or 52:105)[(27)]. At the same time, Näther et al. 2022 are unable to identify any relationship between sex and decadence in the lumbar intervertebral segment([18)]. This hypothetical sex difference may be the biotic reaction to the process of conceiving, being pregnant with, and giving birth to children. And, the physical anxiety of child-care, and the decrease in hormone levels in women, especially estrogen. The morphological-pelvic girdle variation between men and women also underlies accelerated disc degeneration[(28)]. Recently, a genetic factor also performs a significant role[(29)]. In a second axis of vertebral degeneration, anatomical-morphologic changes of disc height appear on MRI as a change in signal, meaning signal inhomogeneity or signal attenuation[(30)]. A decrease in disc height is often observed more frequently with increasing age in patients attributable to short stature in the elderly. This finding supports studies by several scientists, who report that loss of disc height is a normal change with age and are more common in women with degenerative disc structural changes[(31)]. Näther et al. 2022 showed that there were insignificant variances in total disc height through entirely age groups at the same time[18]. At the same time, there was a decrease in relative height by 66-80% in all totals. Loss or decrease in disc tone is associated with a decreased level of proteoglycans which also results in a fibrotic change in the nucleus pulposus and reduces its compressible and elastic properties [(32)]

Also, Malkoç et al. found that the average height diameter at the L4:L5 level in men was 14.3 mm and 13.6 mm in females, and the level of L5: S1 will be 13.92 mm for males and 14.45 mm for females ([33)]. Although this result was greater than the consequence of this research, there is a general agreement that disk height in women is much smaller than in men. Several analyses have reported a decrease in disc height at L5: S1[34]. Urquhart et al. 2014 Age, injury, and weight gain in 2014 can cause decreased L5:S1 disc height, due to disc shape, with association with lordosis angle and rupture of annular fibrosis due to disturbance of the both superior and inferior peripheral plates because of weight acting on the discs[34]. In addition, there are several assessments that have attempted to identify the causes of decreased disc height in advanced age, showing that it occurs significantly only when associated with other symptoms of disc degeneration. In addition, there are many revisions that determined the reasons for decreased disk height at an advanced age, and the study showed that it occurs significantly only when it is related to other symptoms of spondylosis [35].

The reasons may be environmental factors such as the patient's height or lifestyle, or genetic factors[36]. Recent studies revealed that it was the main cause of its possible causes of disc restriction could be either loss of disc material or dehydration causing volume loss[(37)]. Loss of material by herniation or annular tear is likely to have a significant effect on disc thickness and height. Also in this paper, a morphological study of another typical pattern of lesions related to lower spine disintegration is a thickness of a Ligamentum flavum. Yoshiiwa 2016, found that the mean width of ligamenta flava was 4.4 ± 1.0 mm on the level L4:5 for all patients [(38)].

The study demonstrated a clear relationship between increased width and degenerative disk disorder[(39)]. Analysis of many studies showed that there is a tendency toward thickening of ligamenta flava with age, which was attributed to oxidative stress in evolution[(40)]. As for the current study; the maximum thickness was at L4:L5; L5:S1; and L3:L4 respectively. This is consistent with findings by others, Khasawneh et al. 2021 found that the width was significantly larger at the L4:L5 level than at the L3:L4 level [(41)]. They attribute these findings to the superior flexibility of both segments compared to the L5:S1 segment, the latter being more stable due to the presence of broader ligaments in this lumbar region as well as the large transverse process of the L5 spine[42]. In addition, the articulated sides of the S1 adapt to reduce stress in this part. Wang et al. 2021 had a different opinion, finding that the thickness level in the L5:S1 region was significantly more than that of L4:L5 [(11)]. The reason for this difference is attributed to the appearance of calcification tissue or lumps, and crystallization of the ligaments, which contributed to differences in the mechanical characteristics of ligaments in elderly patients[(43)].

Bone structural changes increase with age groups. While spondylosis can be considered the most common osseous modification[(44)]. Early signs of lumbar spondylophytes form earlier. It is worth noting that in the eighth decade, spondylophytes are : exists in all cases. Recent bone development in this area is a result of the strained annular ligament. The smooth borders in vertebral column modify by the existence of advanced bony protuberant parallel at these borders Greatest of them is an anterior projection. While Posterior vertebral projections are not as much and infrequently cause neuropathy[(45)].

Disc space narrowing is another degenerative feature that has both anatomical and structural dimensions. As disc stenosis causes damage to the “nucleus pulposus”, the “annulus fibrosus”, and the supporting framework of backbone. The occurrence of lumbar vertebral stenosis has been conveyed to increase with the index of age. Yabuki et al. 2013 how revealed that age has a great influence on the morphological changes of the vertebrae, especially the height of the vertebrae in people in the seventh decade of life irrespective of sex (5.7%)[(46)]. The researcher Lurie et al. 2016 results agreed that the prevalence of spinal stenosis increases with oldness and that 21% of subjects with anatomical stenosis on MRI showed no symptoms [(47)]. Although a large percentage of the elderly, have a certain level of spinal stenosis that appears on imaging at the same time, they are asymptomatic or have only mild symptoms. Brinjikji et al.2015 assumes that asymptomatic people increased from 37% in twenty-year-olds to 96% in eighty-year-olds[(48)]. An explanation of the increasing incidence of spine disorder to the increasing evolution of medical imaging. Spinal stenosis occurs as a result of, dehydration and shrinkage of the discs with age. Teraguchi et al. 2017 agreed that degenerative changes in the discs produce spinal stenosis, and their investigation showed that the commonness of degenerative discs concluded the whole vertebral was more than 90% in both sexes over fifty years old [(4)]. This result is consistent with the result of the current research. From all of the above, it becomes possible to see common indications of intervertebral disc degeneration. As an anatomical opinion, it is related to age, and it has been classified according to the site in which the spine is affected. A slipped disk is frequently begun by slow, aging-associated wear or tear in a disintegrated disc. By time, the intervertebral disc comes to be less flexible and further prone to rupture, even with the slightest stress or sprain. A prolapsed disk is the best indicator of degeneration Zielinska et al., 2021 said that many infected people are asymptomatic, with a rate that may increase from 30% to 84% between ages 20 and 80 years [(13)]. Rahyusalem et al. 2020, agree with the results of later studies, in that all cases have an increased possibility of nerve neuropathy[(22)]. Another study showed that disc protrusion was found in (63.6%) of patients, and extrusion was found in (18.2%) and (9.1) of disc bulging [(21)], on the other hand, Suthar et al., in a study in 2015 it was found that extrusion was usual at the L4: L5 level (42.86%). Disc bulging mainly occurs at L3:L4 17 (25.76%) and L4:L5 disc level 17 (25.76%) 23. All above are agreement with the results of this series.

Most studies have proven that "Schmorl's node". The majority of them are located in the upper lumbar vertebrae with 16.6% of cases at the L3: L4 level, and for this reason, there is a direct correlation between the presence of "Schmorl's node" and degenerative disc in an affected area[49]. The sources stated that the high prevalence of “Schmorl nodes” at the L3:L4 level is credited to the detail that the total load on the spine rises in a caudal manner. Because of the higher mechanical load concentrated over the lower lumbar region. Consequently, the existence of “Schmorl's nodes” in this area would be the highest. On the other hand, the mechanistic force on both the higher and lower end plates of the lumbar section has a tendency to surge caudally, the representative that the end plates of the superior lumbar sections were stronger than those in inferior portions [50]

CONCLUSION:

It is possible to measure the changes and distribution signs of lumber spine degeneration induced by aging and to compare the results quantitatively with reference values. All author suggested that age and sex increase speed the progression of disc disintegration of lumber spine. Using the MRI, it is viable to assess the changes and spreading of lumber spine degeneration triggered by aging and to compare the results quantitatively with reference values. There is a universal impression that age and sex increase the degeneration of disc of lumber spine.

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