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Clinical and radiological study of single-level degenerative lumbar disc disease in Eastern India Medical College

Krishnendu Sardar[1], Md Salim Uz Zaman[2], Soumedhik Dey[3], Sumana Baidya[4]

[1]Assistant Professor, Department of Neurosurgery, [2]Associate Professor, Department of Physiology, NRS Medical College and Hospital, Kolkata, [3]Associate Professor, Department of Anatomy, Malda Medical College, Malda, [4]Assisstant Professor, Department of Biochemistry, Diamond Harbour Government Medical College and Hospital, South 24 Parganas, West Bengal, India

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ABSTRACT

Background: Low back pain secondary to lumbar disc degenerative disease (LDDD) usually affects young to middle-aged persons. It presents as a sharp shooting type of pain, mild tingling sensation, and a dull ache. There are many risk factors associated with the LDDD, such as advancing age, smoking, and obesity. The annual incidence of prolapsed lumbar intervertebral disc is about 5–10%. Lumbar disc herniation is the pathological condition for which spinal surgery is most often performed. Treatment for lumbar disc herniation can be conservative or surgical, and which one is effective is always controversial. The purpose of conducting this study is to assess different clinical features, magnetic resonance imaging (MRI) characteristics, and postsurgical outcome of single-level lumbar disc disease. **Aims and Objectives:** To evaluate the clinical symptoms, functional status, and most commonly affected lumbar level in patients with single-level LDDD along with post-operative outcome of that level. **Materials and Methods:** 50 symptomatic patients who were diagnosed as single-level disc degenerative disease by MRI, not responding to conservative treatment, were included in our study. It is conducted over a period of 2 years in Bangur Institute of Neuroscience. Any patient having previous surgery is excluded from our study. **Results:** It has been found that L4-L5 level disc herniation and posterolateral site is more common. The most common type is protrusion. **Conclusion:** It helps surgeons to locate the level, type, and site of degenerative disc disease in symptomatic patients who fail to respond to conservative management. Surgical outcome is better than conservative management.

Key words: Lumbar disc degenerative disease; Visual Analog Scale score; Oswestry Disability Index Score; site; type

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INTRODUCTION

The spine undergoes significant degeneration from lumbar disc problems, with single-level lumbar disc degenerative disease (LDDD) being the most prominent form of spine disease. The degenerative process of intervertebral discs causes disc herniation and nerve root compression, which produces low back pain (LBP) and radiculopathy symptoms.[1] LDDD represents a major worldwide disability cause that has intensified because of population aging along with physical workload and reduced physical activity. The condition creates major life quality issues for individuals because it restricts their movement and functional ability, which causes patients to consider surgery after standard treatment fails.[2]

The development of magnetic resonance imaging (MRI) systems during the past years has helped clinicians improve their comprehension of LDDD's radiological features to facilitate both diagnostic accuracy and treatment

Address for Correspondence:
Dr. Soumedhik Dey, Associate Professor, Department of Anatomy, Malda Medical College, Malda, West Bengal, India.
Mobile: +91-9433352071. **E-mail:** sdhik.dey82@yahoo.co.in

roadmaps.[3,4] Surgical procedures such as laminectomy and discectomy become necessary when conservative treatments based on physical therapy and medication cannot alleviate symptoms.[5] Several studies have shown the population statistics, medical presentation, and therapeutic results for LDDD patients. Middle-aged adults face the highest risk of developing lumbar disc degeneration, yet males develop the condition at a higher rate because they perform physical labor and engage in strenuous activities.[6] The study conducted by Earls and Kiefer demonstrated that lumbar disc degeneration usually results in both lower back pain and radiculopathy and sciatica symptoms.[7] According to radiological studies, L4-L5 stands as the main site of disc involvement in LDDD followed by L5-S1 and L3-L4 as additional locations.[8] The main type of herniation occurs in the posterolateral area, and this condition frequently leads to nerve root compression and sciatica symptoms, according to Zhang et al.,[9] Studies demonstrate that disc protrusions exist as the most prevalent form of herniation.[10]

Patients with LDDD benefit profoundly from discectomy surgical procedures since these methods effectively decrease pain symptoms while enhancing patient functionality. The visual analog scale (VAS) pain scores and Oswestry Disability Index (ODI) scores demonstrated substantial improvements following surgical procedures.[11,12] The diagnostic and management aspects of LDDD remain difficult to overcome. The diagnosis and treatment options have improved but patients with single-level LDDD experience ongoing pain together with functional limitations.[13] The inability of traditional treatment methods to sustain pain relief leads patients to choose surgical procedures.[14] Despite the effectiveness of surgery to provide sustained relief and improve quality of life, there is ongoing investigation into it. Moreover, more comprehensive studies are required to reveal more of the clinical, radiological, and post-operative outcomes in more depth, paying particular attention to the long-term impact and individual patient factors that may affect treatment success. The study provides essential information about which lumbar disc levels, the herniation types, and surgical effectiveness in pain relief and functional recovery.

Aims and objectives

1. To evaluate the clinical symptoms and functional status of patient with single-level LDDD.
2. Study the post-operative outcome of single-level lumber disc degenerative disease by assessing pre- and post-operative VAS scale and ODI.
3. To identify the most commonly affected lumbar level in the study population.

MATERIALS AND METHODS

Study area and population

The study was conducted at the Bangur Institute of Neurosciences, a leading medical institute for neurology. The patient population was 50 adult individuals aged 18 years and above with single-level LDDD. In these patients, surgical intervention was selected, and the surgical procedure was laminectomy or discectomy. Surgical treatment was considered after the failure of conservative therapy.

Study design

This was longitudinal observational research. The study period was from January 2016 to December 2017. This was an observational study, which allowed pre-operative observation of patients, during surgical treatment, and at regular periods postoperatively to evaluate the efficacy of surgical treatment of single-level lumbar disc disease.

Inclusion criteria

1. Patients who have LBP symptoms and radiculopathy signs in the lower limb
2. MRI diagnosed case of single-level LDDD
3. Patient who needs surgery for single-level LDDD due to failure of conservative therapy.

Exclusion criteria

1. Patient with spinal trauma
2. History of spinal surgery
3. Patient having active spinal infections and malignancy
4. Pregnant women.

Parameters studied

Multiple essential factors were studied to understand the effects of single-level lumbar disc degeneration and its surgical treatment outcomes. Demographic indicators such as age, gender, occupation, marital status, and educational background were chosen for the study to evaluate the possibility of some patterns or relationships between these variables and the prevalence of LDDD. The clinical profile included an assessment of presenting symptoms, including LBP and radiculopathy symptoms, symptom duration, onset type, and other clinical factors such as neurogenic claudication and previous similar complaints. MRI was used to perform a detailed evaluation of disc condition and herniation type and spinal pathologies, including lateral recess narrowing. VAS for pain severity and ODI for functional impairment were assessed before surgery and at 1-month and 3-month intervals, and the treatment efficacy was evaluated.

RESULTS

Demographic profile

The demographic profile presents detailed information about the study participants, including their age distribution together with gender breakdown, occupational status, and marital and educational information. These specific demographic variables helped to better understand the characteristics and potential risk factors that affect single-level LDDD.

Table 1 displays the demographic profile along with family background data and residential information about the participants. Most patients belonged to the 4th and 5th decades of life, and the 30–40 years (40%) and 40–50 years (42%) of age groups showed the maximum frequencies. The study population consisted mainly of male patients who were daily laborers (76% and 72%, respectively). Majority of the patients were married at 86% and possessed primary education at 72%. 24% of patients reported a family background with lumbar disc degeneration. The patients from rural areas made up 76% of the total participants showing a higher prevalence of this condition.

Table 1: Demographic profile of patients with single-level lumbar disc degenerative disease

Category	Subcategory	Number of patients	Percentage
Age range	20–30 years	8	16
	30–40 years	20	40
	40–50 years	21	42
	50–60 years	1	2
Gender	Male	38	76
	Female	12	24
Occupation	Daily labourer	36	72
	Homemaker	11	22
	Office worker	3	9
Marital status	Married	43	86
	Unmarried	7	14
Educational status	Illiterate	7	14
	Primary (Up to 5th)	36	72
	Matric	7	14
Family History	Positive	12	24
	Negative	38	76
Residence	Urban	12	24
	Rural	38	76

Clinical profile

The clinical profile section delivered comprehensive information about symptom presentations together with their patterns among patients who had single-level LDDD. The section emphasized four significant elements, which included LBP alongside radiculopathy and sciatica, together with pain intensification when patients performed walking, standing, or sitting activities. The clinical characteristics of patients with single-level LDDD can be found in Table 2. The patient population comprised mostly of individuals who exhibited both LBP and radiculopathy (78%), but LBP existed as the sole complaint in 22% of patients. Of the patients with sciatica, 79.49% experienced pain on one side of their body, whereas 20.51% presented with pain on both sides. The main trigger for pain was walking among patients (80%), while standing came next (70%), and sitting followed (50%). The condition of neurogenic claudication affected 36% of the patient population. The symptoms persisted longer than 6 months according to 84% of patients, and 80% of these patients noted that their symptoms developed gradually.

Table 2: Clinical profile of patients with single-level lumbar disc degenerative disease

Clinical complaint	Number of patients	Percentage
Low back pain with radiculopathy	39	78
Low back pain only	11	22
Sciatica (unilateral)	31	79.49
Sciatica (bilateral)	8	20.51
Aggravation of pain (walking)	40	80
Aggravation of pain (standing)	35	70
Aggravation of pain (sitting)	25	50
Neurogenic claudication present	18	36
Neurogenic claudication not present	34	68
Duration of symptoms (<6 months)	8	16
Duration of symptoms (>6 months)	42	84
Onset of symptoms (acute)	10	20
Onset of symptoms (insidious)	40	80

Neurological examination

A neurological examination evaluated motor functions together with reflexes and sensory responses in patients who had single-level LDDD. This showed important outcomes which included the straight leg raising test (SLRT) and reflex responses muscle strength and sensory deficits. The neurological examination results from patients with single-level LDDD appear in Table 3. The results of the SLRT showed that 82% of patients experienced nerve root tension between 60° and 80°. All patients demonstrated normal lower limb muscle bulk during the examination. Patients demonstrated normal lower limb power levels in 100% of cases, but some patients displayed mild weakness (22%) affecting their extensor hallucis longus muscle. The patients demonstrated normal muscle tone together with knee reflexes, which were rated 2+ bilaterally. The ankle reflexes were found to be diminished in 30% of patients who underwent testing. Neurological dysfunction was observed through an absent Babinski reflex response in 24% of patients, while 76% showed a flexor response.

Radiological profile

Patients with single-level LDDD exhibit different types of disc herniation, which appear at specific sites according to radiological examinations. The most prevalent herniation

Table 3: Neurological examination findings in patients with single-level lumbar disc degenerative disease

Neurological examination	Number of patients	Percentage
Straight leg raising test		
60–80°	41	82
40–60°	9	18
Bulk of lower limbs (bilateral)		
Normal	50	100
Power in all groups of lower limbs		
Extensor hallucis longus (EHL) 5/5	50	100
EHL power 4/5 (Any side)	11	22
Tone in lower limbs		
Normal	50	100
Knee reflex		
2+ (Bilateral)	50	100
Ankle reflex		
2+ (bilateral)	26	52
1+ (any side or both sides)	15	30
Absent (any side or both sides)	9	18
Babinski reflex		
Flexor (bilateral)	38	76
Absent (any side or both sides)	12	24
Decreased sensation to pin prick		
Absent (bilateral)	39	78
Present (any side or both sides)	11	22

type occurs as protrusions, while posterolateral areas represent the main location for herniations. The clinical importance of disc herniation characteristics becomes evident because these characteristics help medical professionals understand symptoms such as nerve root compression and sciatica while choosing appropriate treatment methods.

The distribution of disc herniation types in single-level LDDD is presented in Figure 1. The protrusion was the most common type of herniation (35 patients, 70%), extrusion was seen in 12 patients (24%), and migration in 3 patients (6%). The most common type of protrusion is often associated with nerve root compression and sciatica. Although less common, extrusion can cause more severe complications because of the greater displacement of the disc material. The least common type of migration is at the lower lumbar levels.

The distribution of disc herniation sites in patients with single-level LDDD is presented in Figure 2. Posterolateral herniation was found in the majority of herniations in 31 patients, followed by central herniation in 14 patients and foraminal herniation in 5 patients. The distribution of this presented herniation showed that posterolateral herniations were the most common, with nerve root compression and sciatica being most commonly associated with this.

The distribution of disc herniation types (protrusion, extrusion, and migration) and the associated radiological

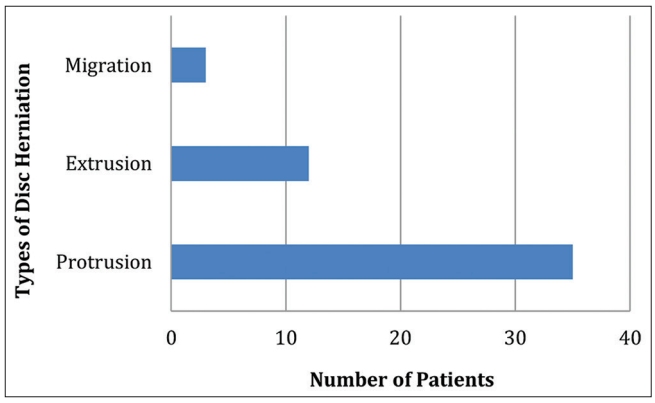

Figure 1: Distribution of disc herniation types in patients with single-level lumbar disc degenerative disease

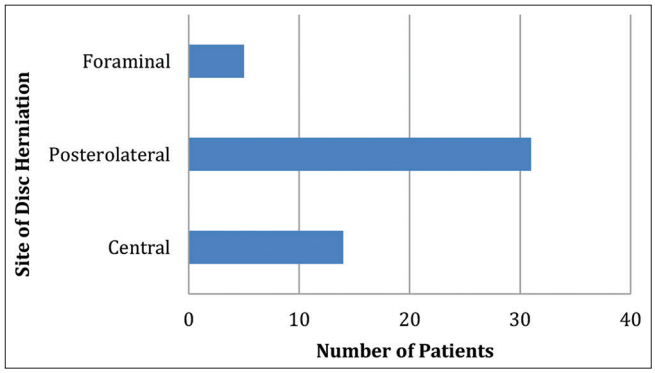

Figure 2: Distribution of disc herniation sites in patients with single-level lumbar disc degenerative disease

findings, including canal narrowing, exiting nerve root compression, neural foramina narrowing, ligamentum flavum hypertrophy, facet joint involvement, and lateral recess narrowing at L3-L4, L4-L5, and L5-S1 are presented in Table 4 and Figures 3 and 4. Most disc protrusions (62.86%) and extrusion (75%) were seen at the L4-L5 level (Figure 5). Nerve root compression (86%) and canal narrowing (64%) in most (86%) of the patients were found at L4-L5 or L5-S1 level. Radiological features are emphasized as the key to understanding the degree of disc degeneration and their clinical relevance to symptom severity and treatment decisions.

VAS and ODI scores

The most common tools to assess pain severity and functional impairment in patients suffering from LDDD are the VAS and ODI. The surgical intervention was effective in terms of pain and disability improvement postoperatively. Preoperatively, the mean VAS score was 7.02 and at 3 months post-surgery, it was 2.38. These results were similar in that the mean ODI score, preoperatively was 50.88 and postoperatively was 19.92 at 3 months which indicated a significant patient improvement in functional ability after surgery, as shown in Table 5.

Table 4: Associated radiological findings by disc level in patients with single-level lumbar disc degenerative disease

Disc level	L3-L4 (%)	L4-L5 (%)	L5-S1 (%)	Total (%)
Disc protrusion	1 (2.86)	22 (62.86)	12 (34.29)	35 (70)
Disc extrusion	0 (0)	9 (75)	3 (25)	12 (24)
Disc migration	0 (0)	2 (66.67)	1 (33.33)	3 (6)
Canal narrowing	0 (0)	21 (65.63)	11 (34.38)	32 (64)
Exiting nerve root compression	1 (2.36)	29 (67.44)	14 (32.56)	43 (86)
Neural foramina narrowing	0 (0)	20 (64.52)	11 (35.48)	31 (62)
Ligamentum flavum hypertrophy	0 (0)	15 (60)	10 (40)	25 (50)
Facet joint involvement	1 (0)	13 (68.42)	5 (26.32)	19 (38)
Lateral recess narrowing	1 (3.57)	22 (78.57)	5 (17.86)	28 (56)

Table 5: Pre-operative and post-operative VAS and ODI scores in patients with single-level lumbar disc degenerative disease

Score	Pre-operative	1 month post-operative	3 months post-operative
VAS	7.02	4.48	2.38
ODI	50.88%	35.44%	19.92%

VAS: Visual Analog Scale, ODI: Oswestry Disability Index

DISCUSSION

This study aimed to evaluate the clinical, radiological, and post-operative results of single-level LDDD treated surgically. Particularly, this study was devised to determine the demographic and clinical profiles of affected patients, common radiological features on MRI of affected patients, and the effectiveness of surgical treatment in reducing patient outcomes as measured by the change in pain severity (VAS scores) and functional disability (ODI scores).

A longitudinal observational study of 50 patients diagnosed with LDDD at the Bangur Institute of Neurosciences was conducted to achieve the objectives. To address these key objectives, the inclusion and exclusion criteria, as well as the parameters studied (demographic, clinical, radiological profiles, and post-operative outcomes), were all designed.

Most of the patients were middle-aged, predominantly male, and showed a higher incidence of lumbar disc degeneration in daily laborers (72%). Consistent with previous studies, most of the patients (78%) presented with LBP and radiculopathy, the most common symptoms of LDDD. Most patients had symptoms for longer than

Figure 3: L4-L5 prolapsed inter vertebral disc in axial magnetic resonance imaging as indicated. (Red arrow indicate the pathology)

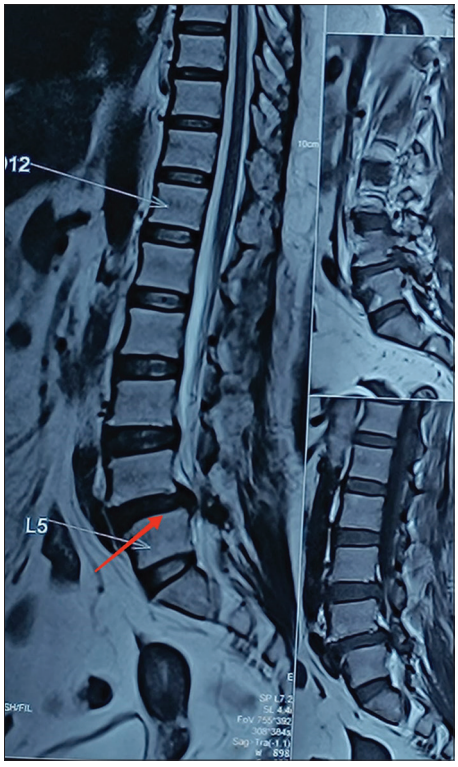

Figure 4: L4-L5 prolapsed inter vertebral disc in sagittal magnetic resonance imaging (same subject). (Red arrow indicate the pathology)

6 months (84%), and the condition was therefore chronic. The study radiologically found that the most commonly affected disc level was L4-L5 (68%), which is consistent with the understanding that the lower lumbar levels (L4-L5 and L5-S1) are more susceptible to degeneration. VAS and ODI scores were significantly improved throughout the study postoperatively. Preoperatively, the mean VAS score was 7.02, which improved to 2.38 3 months after surgery, and the mean ODI score was 50.88% and decreased to 19.92%. Such findings suggest that surgically induced

Figure 5: L5-S1 in prolapsed inter vertebral disc in sagittal magnetic resonance imaging showing posterior herniation. (Red arrow indicate the pathology)

(laminectomy and discectomy) reductions of LDDD do reduce pain and functional disability in patients with LDDD.

The results of this study are consistent with existing literature on LDDD, which is most common in individuals between 30 and 50 years of age. Most of the patients were between 30 and 50 years old (82%). Bonnheim et al., also reported similar findings where there was a high prevalence of LDDD in this age group because of a combination of ongoing mechanical stress on the spine.[15] This study observed the high male predominance (76%) that has been reported in other studies, which is likely due to men being more prone to develop LDDD, since they are more exposed to physically demanding occupations (daily laborers) and lifestyle factors. Ren et al., reported a similar trend, which is that the incidence of LDDD was higher in men than women and particularly in manual labor-intensive occupations.[16] The high incidence of LBP with radiculopathy (78%) is in agreement with other studies, such as Rogerson et al., and Samuelly-Leichtag et al., who observed radiculopathy to be one of the most common symptoms of disc herniation.[17,18] In addition, the study indicated that sciatica is unilateral in 79.49% of cases, consistent with the study of Tesio, which reported that unilateral sciatica was more frequently observed than bilateral.[19]

Herniation types and sites matched earlier reported findings in the clinical data. Most herniations were protrusions (70%), extrusions (24%), and migrations (6%). This observation is supported by the findings of Yu et al., who reported disc protrusions as the most common type of herniation.[20] A study showed that posterolateral herniations usually lead to nerve root compression and sciatica symptoms.[21] The results of this study were post-operative scores that are consistent with the results of Michalak et al., and important pain and disability improvements with surgical discectomy procedures that are consistent with the measured VAS and ODI scores.[22] Apaydin et al., stated that surgical treatments successfully decrease pain and improve the quality of life for patients who suffer from lumbar disc herniation.[23] MRI is shown to be essential to LDDD detection and HSI and type identification.[24] Clinicians can use medical images to determine how much disc degeneration there is and make appropriate treatment choices.

While the study offers useful information about single-level LDDD treatments, it is also limited. It may not generalize to a larger population because the sample size of 50 patients is small. Second, there was no control group of patients who received conservative treatment thus, the outcomes of surgical versus nonsurgical interventions could not be compared. The study was also done at only one medical institution, so the diversity of the patient population may be limited. Furthermore, the study used subjective measures of pain and disability (such as VAS and ODI scores) that may be affected by the patient's perception and reporting bias. To some extent, the finding may have limited generalizability, which is why future research should include bigger, multi-center cohorts to validate and generalize the finding. Further evidence of the effectiveness of surgery for LDDD would rest on a randomized controlled trial comparing surgical treatment to conservative management. Additional long-term follow-up studies are also needed to assess the sustainability of the improvement seen after surgery and to determine whether the improvements will be maintained and whether there will be a recurrence of disc herniation or new disc herniation at other levels. Further research could also centre on the effect of patient-specific factors such as age, comorbidities, and occupation on the outcome of surgical interventions. This might enable hallmarks of tailored treatment for patients and beneficial patient results.

Limitations of the study

Sample size is small, so it could not represents the whole population.

CONCLUSION

This study provides important information concerning clinical, radiological, and post-operative outcomes of patients with single-level LDDD who underwent surgical treatment. Most patients were middle-aged males and there was a higher prevalence in those working in physically demanding occupations. It was found that the most common clinical presentation was LBP with radiculopathy and that most patients had chronic symptoms that lasted more than 6 months. L4-L5 was the most commonly

affected disc level, and the most common type of herniation was protrusion in the posterolateral direction. This is consistent with previous literature that lumbar disc degeneration is most common at lower lumbar levels and is associated with nerve root compression. VAS and ODI were very favorable post-operative outcomes of the patients in terms of pain reduction and functional ability. These results strongly support the efficacy of surgical interventions that include laminectomy and discectomy in the treatment of patients with single-level LDDD who have failed conservative treatment, primarily to improve pain and quality of life. Emphasis is given to the strong evidence for surgical treatment provided by this study, although the small sample size and absence of a comparator group limit the study to some degree. Future studies should use larger multi-center cohorts with randomized controlled trials to further evaluate whether surgery has a long-term effect conferred beyond conservative management. Also, patient-specific factors including age, comorbidities, and occupation should be explored to help with the development of more customized treatment plans for individuals with LDDD. To refine treatment strategies and guarantee optimal outcomes for the patients, further studies with a more diverse patient population and longer follow-up period will be needed.

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REFERENCES

1. Lee YC, Zotti MG and Osti OL. Operative management of lumbar degenerative disc disease. Asian Spine J. 2016;10(4):801-819.
https://doi.org/10.4184/asj.2016.10.4.801
2. Patel S, Kumar S, Soni A, Acharya S and Acharya N. Lumbar disc disease: An overview. In: Mechanism and Genetic Susceptibility of Neurological Disorders. Berlin: Springer Nature; 2024. p. 391-417.
3. Ogbole GI, Efidi R, Agunloye A, Adeleye J, Rimande J and Ogunseinde A. Low-field magnetic resonance imaging assessment of relationship between facet joint tropism and lumbar disc herniation in a cohort of black Africans with low back pain. Afr J Biomed Res. 2023;26(3):335-339.
https://doi.org/10.4314
4. Liu X, Zhao T, Sun C, Shi H, Shi J, Shi G, et al. Evaluation and analysis of surgical treatment for single-level or multi-level lumbar degenerative disease based on radiography. Quant Imaging Med Surg. 2024;14(2):1441-1450.
https://doi.org/10.21037/qims-23-1108
5. Jung B, Han J, Song J, Ngan A, Essig D and Verma R. Interventional therapy and surgical management of lumbar disc herniation in spine surgery: A narrative review. Orthop Rev (Pavia). 2023;15:88931.
https://doi.org/10.52965/001c.88931
6. Kumar N, Dhawan S, Mathur R and Gupta A. Evaluation of degenerative changes of lumbo-sacral spine on MRI. Int J Med Sci Curr Res. 2023;6(2):493-502.
7. Earls B and Kiefer MA. Disc herniation and radiculopathy. In: Spine Pain Care: A Comprehensive Clinical Guide. Berlin: Springer Nature; 2020. p. 155-167.
8. Ruangchainikom M, Daubs MD, Suzuki A, Xiong C, Hayashi T, Scott TP, et al. Patterns of lumbar disc degeneration: Magnetic resonance imaging analysis in symptomatic subjects. Asian Spine J. 2020;15(6):799-807.
https://doi.org/10.31616/asj.2020.0325
9. Zhang AS, Xu A, Ansari K, Hardacker K, Anderson G, Alsoof D, et al. Lumbar disc herniation: Diagnosis and management. Am J Med. 2023;136(7):645-651.
https://doi.org/10.1016/j.amjmed.2023.03.024
10. Chiu CC, Chuang TY, Chang KH, Wu CH, Lin PW and Hsu WY. The probability of spontaneous regression of lumbar herniated disc: A systematic review. Clin Rehabil. 2015;29(2):184-195.
https://doi.org/10.1177/0269215514540919
11. Liang JQ, Chen C and Zhao H. Revision surgery after percutaneous endoscopic transforaminal discectomy compared with primary open surgery for symptomatic lumbar degenerative disease. Orthop Surg. 2019;11(4):620-627.
https://doi.org/10.1111/os.12507
12. Song C, Deng Z, Dai H, Zheng W, Yu G, Wu Y, et al. Comparison of the medium-term outcomes of anterior lumbar discectomy and fusion with minimally invasive transforaminal lumbar interbody fusion: A retrospective cohort study. Orthop Surg. 2024;16(5):1042-1050.
https://doi.org/10.1111/os.14028
13. Bodlák D, Jelen K and Lopot F. Intervertebral (lumbar) disc replacement: The current state and future perspectives. Neuro Endocrinol Lett. 2023;44(7):444-452.
14. Varshneya K, Wadhwa H, Stienen MN, Ho AL, Medress ZA, Herrick DB, et al. Single-stage versus multistage surgical management of single-and two-level lumbar degenerative disease. World Neurosurg. 2021;152:e449-e454.
https://doi.org/10.1016/j.wneu.2021.05.115
15. Bonnheim NB, Lazar AA, Kumar A, Akkaya Z, Zhou J, Guo X, et al. ISSLS prize in bioengineering science 2023: Age- and sex-related differences in lumbar intervertebral disc degeneration between patients with chronic low back pain and asymptomatic controls. Eur Spine J. 2023;32(5):1517-1524.
https://doi.org/10.1007/s00586-023-07542-6
16. Ren BO, O'Donnell JA, Anderson JT, Haas AR, Percy R, Woods ST, et al. Time to surgery affects return to work rates for workers' compensation patients with single-level lumbar disk herniation. Orthopedics. 2021;44(1):e43-e49.
https://doi.org/10.3928/01477447-20201202-06
17. Rogerson A, Aidlen J and Jenis LG. Persistent radiculopathy after surgical treatment for lumbar disc herniation: Causes and treatment options. Int Orthop. 2019;43(4):969-973.
https://doi.org/10.1007/s00264-018-4246-7
18. Samuelly-Leichtag G, Eisenberg E, Zohar Y, Andraous M, Eran A, Sviri GE, et al. Mechanism underlying painful radiculopathy in patients with lumbar disc herniation. Eur J Pain. 2022;26(6):1269-1281.
https://doi.org/10.1002/ejp.1947
19. Tesio L. The flexor-type patient: Low back pain, sciatica, lumbar radiculopathy. In: Low Back Pain and Sciatica: A New Pathogenetic Model and Treatment Principles. Cham: Springer Nature Switzerland; 2025. p. 7-24.
20. Yu P, Mao F, Chen J, Ma X, Dai Y, Liu G, et al. Characteristics and mechanisms of resorption in lumbar disc herniation. Arthritis Res Ther. 2022;24(1):205.

https://doi.org/10.1186/s13075-022-02894-8

21. Liyew WA. Clinical presentations of lumbar disc degeneration and lumbosacral nerve lesions. Int J Rheumatol. 2020;2020(1):2919625.
    https://doi.org/10.1155/2020/2919625
22. Michalak M, Druszcz A, Miś M, Paprocka-Borowicz M and Rosińczuk J. Quality of life, disability level, and pain intensity among patients after lumbar disc surgery: An observational three-month follow-up study. Healthcare (Basel). 2023;11(24):3127.
    https://doi.org/10.3390/healthcare11243127
23. Apaydin AS, Bozyiğit B, Koç-Apaydin Z, Güneş M and Yana M. Effects of different surgical treatments on pain, disability, anxiety and quality of life in lumbar disc herniation. Cir Cir. 2024;92(1): 39-45.
    https://doi.org/10.24875/CIRU.23000415
24. Hansen BB. Introducing standing weight-bearing MRI in the diagnostics of low back pain and degenerative spinal disorders. Dan Med J. 2017;64(10):B5416.

Authors' Contributions:
KS- Definition of content, first draft preparation; **MSUZ-** Design study, statistical analysis and interpretation; **SD-** Concept, design, manuscript preparation and editing of the same; **SB-** Literature survey, coordination and revision.

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Bangur Institute of Neurosciences, Kolkata, India.

Orcid ID:
Dr. Krishnendu Sardar - https://orcid.org/0009-0009-1783-3408
Dr. Md Salim Uz Zaman - https://orcid.org/0009-0009-5482-9897
Dr. Soumedhik Dey - https://orcid.org/0000-0001-8875-3047
Dr. Sumana Baidya - https://orcid.org/0009-0001-4734-6071

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