

## Original Research

### Assessment of canal stenosis of herniated lumbar disc and its correlation to anterior posterior diameter with magnetic resonance

Nitin Agarwal

Assistant Professor, Department of Radio Diagnosis, N C Medical College & Hospital, Panipat, Haryana, India

#### ABSTRACT:

**Background:** In lumbar disc herniation (LDH), narrowing of the space available for the thecal sac can be due to protrusion of disc through an intact AF. The present study was conducted to assess canal stenosis of herniated lumbar disc and its correlation to anterior posterior diameter with magnetic resonance. **Materials & Methods:** 65 lumbar disc herniation syndrome patients of both genders were put in group I and control in group II. Straight leg rising test (SLRT) was carried in cases. Sagittal anterior-posterior (SAG) and cross-sectional area of the spinal canal, the height of I.V. disc, type of disc prolapse, disc hydration, and vertebral body width was recorded. A SAG value of 11 and 12 was regarded as relative stenosis and a value < 11 mm as absolute stenosis. **Results:** Out of 65 patients, males were 35 and females were 30. AP diameter (mm) of spinal cord at L3-L4 in age group 0-20 years in group I was 12.4 and in group II was 12.6, in age group 21-40 years has 12.1 and 12.2, in age group 41-60 years had 12.5 and 12.4 and >60 years had 12.7 and 12.6 in group I and II respectively. The difference was non-significant ( $P > 0.05$ ). AP diameter (mm) of spinal cord at L4-L5 in age group 0-20 years in group I was 11.4 and in group II was 15.6, in age group 21-40 years has 11.1 and 15.2, in age group 41-60 years had 11.8 and 15.4 and >60 years had 11.6 and 15.6 in group I and II respectively. The difference was significant ( $P < 0.05$ ). AP diameter (mm) of spinal cord at L5-S1 in age group 0-20 years in group I was 11.2 and in group II was 16.4, in age group 21-40 years has 11.1 and 16.2, in age group 41-60 years had 11.6 and 16.7 and >60 years had 11.3 and 16.3 in group I and II respectively. The difference was significant ( $P < 0.05$ ). **Conclusion:** The maximum number of disc prolapse occurs between 21 and 40 age group. It is seen maximum number of herniation occurs at the level of L4-L5.

**Key words:** Spinal pain, lumbar disc herniation, MRI

Received: 16 December, 2019

Accepted: 19 January, 2020

**Corresponding author:** Nitin Agarwal, Assistant Professor, Department of Radio Diagnosis, N C Medical College & Hospital, Panipat, Haryana, India

**This article may be cited as:** Agarwal N. Assessment of canal stenosis of herniated lumbar disc and its correlation to anterior posterior diameter with magnetic resonance. J Adv Med Dent Sci Res 2020;8(2):249-252.

#### INTRODUCTION

Spinal pain is one of the most frequently reported symptoms in the industrialized world, in particular low back pain. In lumbar disc herniation (LDH), narrowing of the space available for the thecal sac can be due to protrusion of disc through an intact AF, extrusion of the NP through the AF though still maintaining continuity with the disc space, or complete loss of continuity with the disc space and sequestration of a free fragment.<sup>1,2</sup>

Several changes in the biology of the intervertebral disc are thought to contribute to LDH.<sup>3</sup> These include reduced water retention in the NP, increased percent of type I collagen within the NP and inner AF, degradation of collagen and extracellular matrix (ECM) materials, and upregulation of systems of degradation such as apoptosis, matrix metalloproteinase (MMP) expression, and

inflammatory pathways.<sup>4</sup> Various radiological procedures which are used for the diagnosis have their own advantage and disadvantage.<sup>5</sup> But, magnetic resonance imaging (MRI) which is a relatively newer technique, is treated as the gold standard in this field. Parasagittal images are used to evaluate foraminal stenosis. In regard to the margins of the foramen, the disc and vertebral body lie anteriorly, the pedicles superiorly and inferiorly, and the facet joints posteriorly.<sup>6</sup> The present study was conducted to assess canal stenosis of herniated lumbar disc and its correlation to anterior-posterior diameter with magnetic resonance.

#### MATERIALS & METHODS

The present study comprised of 65 lumbar disc herniation syndrome patients of both genders. All

gave their written consent for the participation in the study.

Data such as name, age, gender etc. was recorded. Patients were put in group I and control in group II. Straight leg rising test (SLRT) was carried in cases. A positive SLRT at 40° or less was suggestive of root compression. Criteria for lumbar stenosis on MRI were a distortion or paucity of epidural fat either in the neural foramina, lateral recess or posteriorly between the ligamentum flavum a diminution in the

overall size of the neural foramina, neural canal and/or thecal sac. Sagittal anterior-posterior (SAG) and cross-sectional area of the spinal canal, the height of I.V. disc, type of disc prolapse, disc hydration, and vertebral body width was recorded. A SAG value of 11 and 12 was regarded as relative stenosis and a value < 11 mm as absolute stenosis. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

## RESULTS

**Table I Distribution of patients**

Total- 65		
Gender	Males	Females
Number	35	30

Table I shows that out of 65 patients, males were 35 and females were 30.

**Table II AP diameter of spinal canal at L3-L4 level**

Age group (years)	Group I	Group II	P value
0-20	12.4	12.6	0.90
21-40	12.1	12.2	
41-60	12.5	12.4	
>60	12.7	12.6	

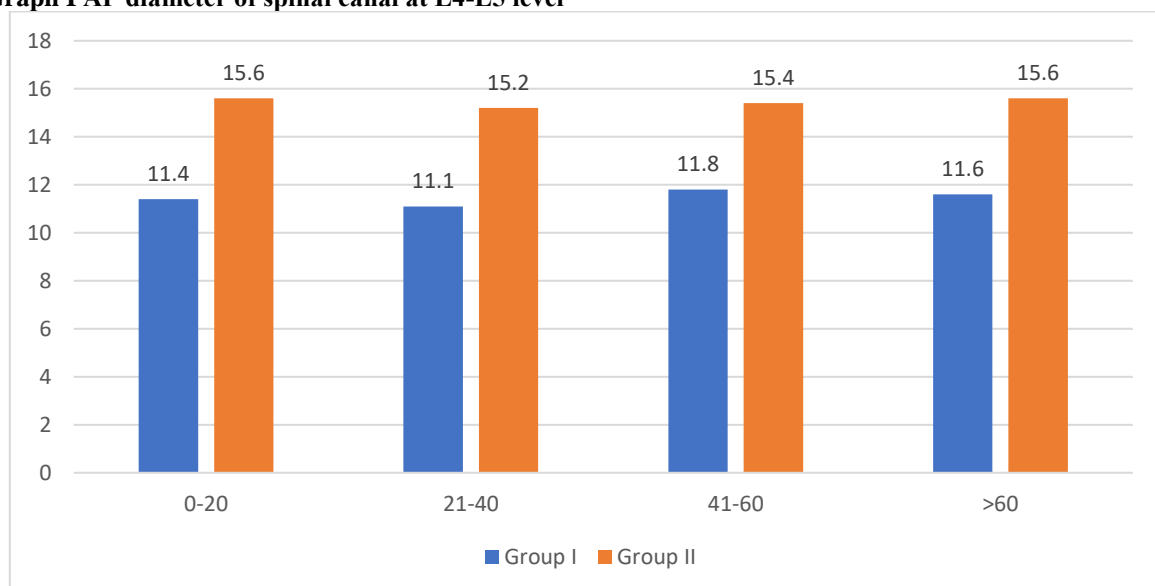
Table II shows that AP diameter (mm) of spinal cord at L3-L4 in age group 0-20 years in group I was 12.4 and in group II was 12.6, in age group 21-40 years has 12.1 and 12.2, in age group 41-60 years had 12.5 and 12.4 and >60 years had 12.7 and 12.6 in group I and II respectively. The difference was non- significant ( $P > 0.05$ ).

**Table III AP diameter of spinal canal at L4-L5 level**

Age group (years)	Group I	Group II	P value
0-20	11.4	15.6	0.02
21-40	11.1	15.2	
41-60	11.8	15.4	
>60	11.6	15.6	

Table III, graph I shows that AP diameter (mm) of spinal cord at L4-L5 in age group 0-20 years in group I was 11.4 and in group II was 15.6, in age group 21-40 years has 11.1 and 15.2, in age group 41-60 years had 11.8 and 15.4 and >60 years had 11.6 and 15.6 in group I and II respectively. The difference was significant ( $P < 0.05$ ).

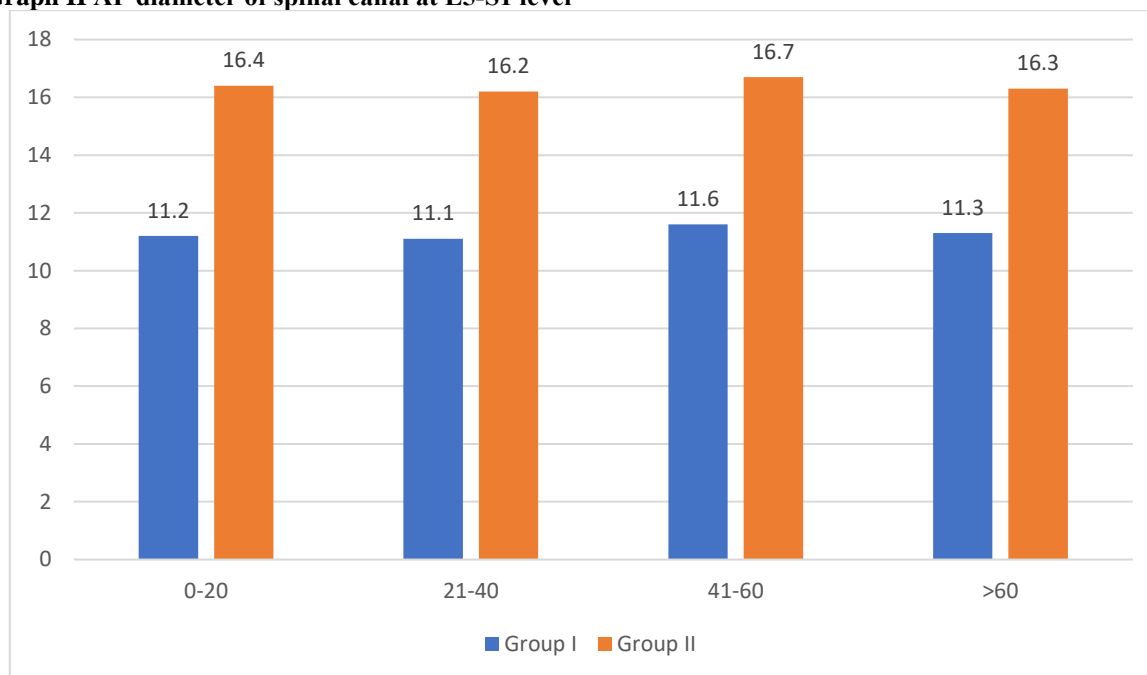
**Graph I AP diameter of spinal canal at L4-L5 level**



**Table IV AP diameter of spinal canal at L5-S1 level**

Age group (years)	Group I	Group II	P value
0-20	11.2	16.4	0.05
21-40	11.1	16.2	
41-60	11.6	16.7	
>60	11.3	16.3	

Table IV, graph II shows that AP diameter (mm) of spinal cord at L5- S1 in age group 0-20 years in group I was 11.2 and in group II was 16.4, in age group 21-40 years has 11.1 and 16.2, in age group 41-60 years had 11.6 and 16.7 and >60 years had 11.3 and 16.3 in group I and II respectively. The difference was significant ( $P < 0.05$ ).

**Graph II AP diameter of spinal canal at L5-S1 level**

## DISCUSSION

Dehydration is known to contribute to the pathogenesis of degenerative disc disease. Although a specific genetic polymorphism has not been associated with LDH, aquaporins have been implicated. It is found that aquaporin-I (AQPI) to be linearly correlated with preoperative T2-weighted magnetic resonance imaging (MRI) signal intensity.<sup>7</sup> This suggests that AQPI may have a role in this dehydration, which is known to contribute to degeneration. However, more research is necessary to better elucidate the role of aquaporins in the pathogenesis of LDH. Not all disc herniation occurs in the context of degenerative disease.<sup>8</sup> A subset of patients with LDH lack evidence of severe degenerative disc including proteoglycan and water loss in the NP. In these cases, herniation occurs as a result of spinal overloading.<sup>9</sup> The present study was conducted to assess canal stenosis of herniated lumbar disc and its correlation to anterior-posterior diameter with magnetic resonance.

We observed that out of 65 patients, males were 35 and females were 30. AP diameter (mm) of spinal cord at L3-L4 in age group 0-20 years in group I was 12.4 and in group II was 12.6, in age group 21-40

years has 12.1 and 12.2, in age group 41-60 years had 12.5 and 12.4 and >60 years had 12.7 and 12.6 in group I and II respectively. Varol et al<sup>10</sup> found that the absolute stenosis of the spinal canal will be <11 mm and the relative stenosis values will be 11 and 12 mm in 120 patients who have lumbar disc herniation syndrome & their MRI findings are compared with MRI findings of 80 normal persons who are used as control. The different parameters are compared & observed that the maximum number of disc prolapse occurs between 31- 40 age group. Taking the vertebral level into consideration, it is seen maximum number of herniation occurs at the level of L4 - L5.

We found that AP diameter (mm) of spinal cord at L4-L5 in age group 0-20 years in group I was 11.4 and in group II was 15.6, in age group 21-40 years has 11.1 and 15.2, in age group 41-60 years had 11.8 and 15.4 and >60 years had 11.6 and 15.6 in group I and II respectively. Prasad et al<sup>11</sup> worked on the anatomy and sociodemographic character of lumbar disc prolapse and analyzed properties such as AP diameter and cross-sectional area of spinal canal to establish their relation with each other and to compare the values with that of previous workers. They mentioned that disc prolapse occur at 34.4% in L4-L5 level and

26.7% in L5-S1 level. The AP diameter of a spinal canal of L1-L2 and L2-L3 has not been taken into account as the incidence of cases with disc prolapse in those levels are very less.

We found that AP diameter (mm) of spinal cord at L5-S1 in age group 0-20 years in group I was 11.2 and in group II was 16.4, in age group 21-40 years was 11.1 and 16.2, in age group 41-60 years was 11.6 and 16.7 and >60 years was 11.3 and 16.3 in group I and II respectively. Andersson et al<sup>12</sup> suggested that when the axial AP diameter of the spinal canal is <9.2 mm, it is called congenital lumbar stenosis. Degenerative lumbar spinal stenosis manifests primarily after the sixth decade of life with L4-L5 and L5-S1 level predominance while congenital stenosis presents earlier age with similar findings but multilevel involvement and fewer degenerative changes.

The limitation of the study is small sample size.

## CONCLUSION

Authors found that the maximum number of disc prolapse occurs between 21 and 40 age group. It is seen maximum number of herniation occurs at the level of L4-L5.

## REFERENCES

1. Martin BI, Deyo RA, Mirza SK, et al. Expenditures and health status among adults with back and neck problems. *JAMA*. 2008;299(6):656.
2. Kepler CK, Ponnappan RK, Tannoury CA, Risbud MV, Anderson DG. The molecular basis of intervertebral disc degeneration. *Spine J*. 2013;13(3):318-330.
3. Kalb S, Martirosyan NL, Kalani MYS, Broc GG, Theodore N. Genetics of the degenerated intervertebral disc. *World Neurosurg*. 2012;77(3-4):491-501.
4. Urban JPG, Roberts S. Degeneration of the intervertebral disc. *Arthritis Res Ther*. 2003;5(3):10.
5. Brayda-Bruno M, Tibiletti M, Ito K, et al. Advances in the diagnosis of degenerated lumbar discs and their possible clinical application. *Eur Spine J*. 2014;23(SUPPL. 3):315-323.
6. Colombier P, Clouet J, Hamel O, Lescaudron L, Guicheux J. The lumbar intervertebral disc: from embryonic development to degeneration. *Jt Bone Spine*. 2014;81(2):125-129.
7. Haughton VM, Eldevik OP, Magnaes B, Amundsen P. A prospective comparison of computed tomography and myelography in the diagnosis of herniated lumbar disks. *Radiology* 1982;142:103-10.
8. Modic MT, Steinberg PM, Ross JS, Masaryk TJ, Carter JR. Degenerative disk disease: Assessment of changes in vertebral body marrow with MR imaging. *Radiology* 1988;166:193-9.
9. Lama P, Le Maitre CL, Dolan P, Tarlton JF, Harding IJ, Adams MA. Do intervertebral discs degenerate before they herniate, or after? *Bone Jt J*. 2013;95 B(8):1127-1133.
10. Varol T, Iyem C, Cezayirli E, Erturk M, Kayalioglu G, Hayretoglu C. Comparative morphometry of the lower lumbar vertebrae: Osteometry in dry bones and computed tomography images of patients with and without low back pain. *J Int Med Res* 2006;34:316-30.
11. Prasad R, Hoda M, Dhakal M, Singh K, Srivastava A, Sharma V. Epidemiological characteristics of lumbar disc prolapse in a tertiary care hospital. *Internet J Neurosurg* 2005;3:1.
12. Andersson GB, Schultz A, Nathan A, Irstam L. Roentgenographic measurement of lumbar intervertebral disc height. *Spine (Phila Pa 1976)* 1981;6:154-8.