

ORIGINAL RESEARCH

Assessment of canal stenosis of herniated lumbar disc using magnetic resonance imaging

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ABSTRACT

Background: One of the most common complaints is spinal pain, especially low back pain. The present study was conducted to assess canal stenosis of herniated lumbar disc with magnetic resonance imaging. **Materials & Methods:** 80 patients with lumbar disc herniation syndrome of both genders were kept in group I and group II (80) had control subjects. In group I, patients underwent straight leg rising test (SLRT). A positive SLRT at 40° or less was suggestive of root compression. **Results:** Out of 80 patients, males were 45 and females were 35. In age group 0-20 years AP diameter of spinal cord at L3-L4 in group I was 12.5 mm and in group II was 12.7 mm, in age group 21-40 years was 12.2 mm and 12.3 mm respectively, in age group 41-60 years was 12.6 mm and 12.3 mm respectively and >60 years was 12.8 mm and 12.7 mm in group I and II respectively. The difference was non-significant ($P > 0.05$). In age group 0-20 years AP diameter of spinal cord at L4-L5 in group I was 11.5 mm and in group II was 15.7 mm, in age group 21-40 years was 11.2 mm and 15.3 mm, in age group 41-60 years was 11.9 mm and 15.5 mm and >60 years was 11.7 mm and 15.8 mm in group I and II respectively. The difference was significant ($P < 0.05$). AP diameter of spinal cord at L5-S1 in age group 0-20 years in group I was 11.3 mm and in group II was 16.5 mm, in age group 21-40 years was 11.2 mm and 16.3 mm, in age group 41-60 years was 11.7 mm and 16.9 mm and >60 years had 11.4 mm and 16.4 mm in group I and II respectively. The difference was significant ($P < 0.05$). **Conclusion:** The age range of 21 to 40 years showed maximum disc prolapse. The largest number of herniations was observed to occur at the L4 and L5 levels.

Key words: lumbar disc herniation, MRI, Spinal pain

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INTRODUCTION

One of the most common complaints is spinal pain, especially low back pain. The space available for the thecal sac can narrow in lumbar disc herniation (LDH) for one of three reasons: the disc may protrude through an intact AF, the NP may extrude through the AF while still remaining in continuity with the disc space, or there may be a complete loss of continuity with the disc space and sequestration of a free fragment.^{1,2}

LDH may be caused by a number of alterations in the intervertebral disc's biology.³ These include decreased water retention in the NP, elevated type I collagen percentage in the NP and inner AF, breakdown of collagen and extracellular matrix (ECM) components, and increased expression of inflammatory pathways, matrix metalloproteinase (MMP) expression, and apoptosis, among other systems of degradation.⁴ There are benefits and drawbacks to each of the radiographic techniques employed in diagnosis.

However, in this sector, magnetic resonance imaging (MRI), a relatively newer method, is considered the gold standard. Foraminal stenosis is assessed using parasagittal imaging. Regarding the foramen's edges, the facet and disc are positioned anteriorly, the vertebral body and pedicles are positioned superiorly and inferiorly, and posteriorly.⁵ The present study was conducted to assess canal stenosis of herniated lumbar disc and its correlation to anterior-posterior diameter with magnetic resonance imaging.

MATERIALS & METHODS

The present study consisted of 80 patients with lumbar disc herniation syndrome of both genders. All patients gave their written consent for participation in the study.

Data such as name, age, gender etc. was recorded. Group I comprised 80 patients and group II 80 control subjects. In group I, patients underwent straight leg rising test (SLRT). A positive SLRT at 40° or less

was suggestive of root compression. 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 was the criteria for lumbar stenosis on MRI. 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. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 80		
Gender	Males	Females
Number	45	35

Table I shows that out of 80 patients, males were 45 and females were 35.

Table II Assessment of AP diameter of spinal canal at L3-L4 level based on age group

Age group (years)	Group I	Group II	P value
0-20	12.5	12.7	0.90
21-40	12.2	12.3	
41-60	12.6	12.3	
>60	12.8	12.7	

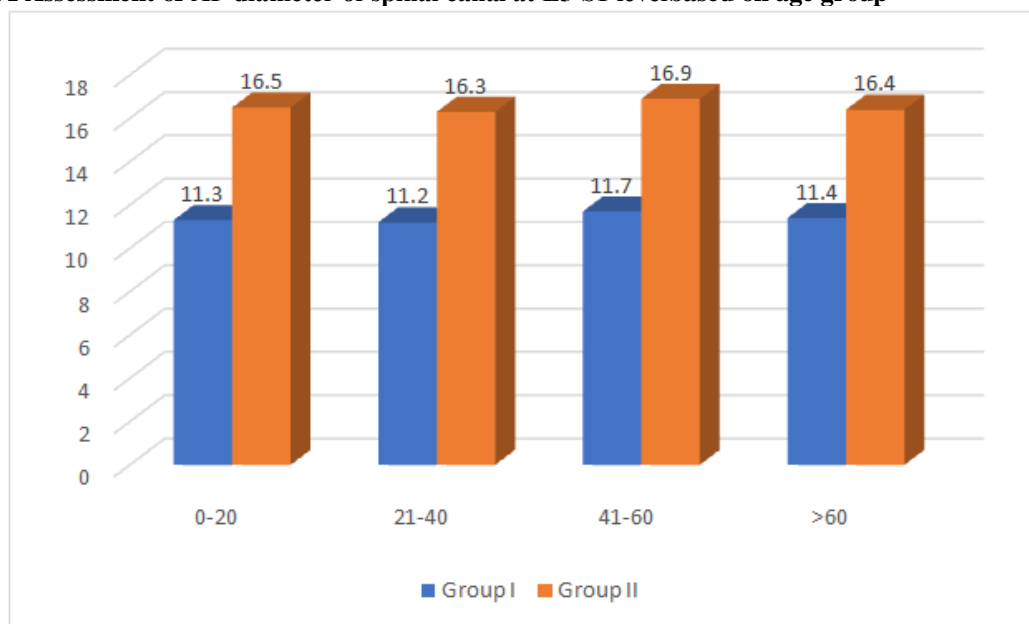
Table II shows that in age group 0-20 years AP diameter of spinal cord at L3-L4 in group I was 12.5mm and in group II was 12.7 mm, in age group 21-40 years was 12.2mm and 12.3 mm respectively, in age group 41-60 years was 12.6mm and 12.3 respectively and >60 years was 12.8mm and 12.7mm in group I and II respectively. The difference was non-significant (P> 0.05).

Table III Assessment of AP diameter of spinal canal at L4-L5 level based on age group

Age group (years)	Group I	Group II	P value
0-20	11.5	15.7	0.04
21-40	11.2	15.3	
41-60	11.9	15.5	
>60	11.7	15.8	

Table III shows that in age group 0-20 years AP diameter of spinal cord at L4-L5 in group I was 11.5mm and in group II was 15.7 mm, in age group 21-40 years was 11.2 mm and 15.3 mm, in age group 41-60 years was 11.9 mm and 15.5 mm and >60 years was 11.7mm and 15.8 mm in group I and II respectively. The difference was significant (P< 0.05).

Graph I Assessment of AP diameter of spinal canal at L5-S1 level based on age group



Graph I shows that AP diameter of spinal cord at L5-S1 in age group 0-20 years in group I was 11.3 mm and in group II was 16.5 mm, in age group 21-40 years was 11.2 mm and 16.3 mm, in age group 41-60 years was 11.7 mm and 16.9 mm and >60 years had 11.4 mm and 16.4 mm in group I and II respectively. The difference was significant ($P < 0.05$).

DISCUSSION

The lower portion of the foramen magnum marks the start of the spinal canal, which finishes at the hiatus sacralis. It generates a wavy canal by following the curve of the vertebrae. There is variation in the canal's diameter.⁶ It is triangular at the lower lumbar region and oval, smaller, at the higher lumbar region. A set of symptoms is brought on by the spinal canal's decreasing size. The spinal column is composed of 23 intervertebral discs, which account for approximately 25% of the column's height.⁷ A portion of the height loss that occurs with aging is caused by the disc shrinking, which also affects the degree to which the vertebral column curves. I.V. discs vary in thickness, with the front being thicker than the rear. The disc acts like a cushion and shock absorber. They have a high water content which is maximum at birth and decreases with ageing.^{8,9} The present study was conducted to assess canal stenosis of herniated lumbar disc with magnetic resonance imaging.

We observed that out of 80 patients, males were 45 and females were 35. Andersson et al¹⁰ 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.

We found that in age group 0-20 years AP diameter of spinal cord at L3-L4 in group I was 12.5 mm and in group II was 12.7 mm, in age group 21-40 years was 12.2 mm and 12.3 mm respectively, in age group 41-60 years was 12.6 mm and 12.3 mm respectively and >60 years was 12.8 mm and 12.7 mm in group I and II respectively. Prasad et al¹¹ 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 observed that in age group 0-20 years AP diameter of spinal cord at L4-L5 in group I was 11.5 mm and in group II was 15.7 mm, in age group 21-40 years was 11.2 mm and 15.3 mm, in age group 41-60 years was 11.9 mm and 15.5 mm and >60 years was

11.7 mm and 15.8 mm in group I and II respectively. The difference was significant ($P < 0.05$). AP diameter of spinal cord at L5-S1 in age group 0-20 years in group I was 11.3 mm and in group II was 16.5 mm, in age group 21-40 years was 11.2 mm and 16.3 mm, in age group 41-60 years was 11.7 mm and 16.9 mm and >60 years had 11.4 mm and 16.4 mm in group I and II respectively. Panda et al¹² established the anatomy of herniated lumbar disc by the help of MRI technique in 120 patients correlated the occurrence of disc herniation with age, sex & vertebral level. 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.

Varol et al¹³ 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.

The limitation of the study is small sample size.

CONCLUSION

Authors found that the age range of 21 to 40 years showed maximum disc prolapse. The largest number of herniations was observed to occur at the L4 and L5 levels.

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