

A study of role of CT myelography in the diagnosis of lumbar canal stenosis and prolapsed intervertebral disc in rural population

Ashish J Agrawal¹, Rushikesh M Patwardhan², Sandeep D Biyani³, Ganesh S Narwane^{4*}, Vivek V Deshmukh⁵

¹Assistant Professor, ³Associate Professor, ^{4,5}Resident, Department of Radio-Diagnosis, ACPM Medical College, Dhule, Maharashtra, INDIA.

²Ex-Assistant Professor, Department of Radio-Diagnosis, Shree Bhausahab Hire Government Medical College, Dhule, Maharashtra, INDIA.

Email: ganeshnarwane1@gmail.com

Abstract

Background: Computed Tomography is a major advance and a revolutionary diagnostic technique in “Radiodiagnosis”. It is a cross sectional imaging modality and allows direct visualization of the bony and soft tissue structures. **Amis and objectives:** To study of role of CT myelography in the diagnosis of lumbar canal stenosis and prolapsed intervertebral disc in rural population **Methodology:** 100 cases from rural population with clinical history of low backache and lower limb neurodeficit with probable lumbar canal stenosis or prolapsed inter-vertebral disc were taken up for CT scanning. Informed consents were obtained from all the participants All patients underwent complete physical and neurological examinations including straight leg raising test, femoral stretch test, ankle/knee reflexes, motor and sensory examinations of both lower limbs. The spine was examined for tenderness and deformity. **Result:** 68% were in 31-50 years of age group. Majority of the patients in the present study were male (65%). Lumbar canal stenosis was diagnosed in 28 cases, Prolapsed inter-vertebral disc was diagnosed in 56 cases and both Lumbar canal stenosis and Prolapsed inter-vertebral disc was diagnosed in 16 cases. Canal stenosis was commonest at L5 level followed by L4 and L3. Right and left (both) side inter-vertebral foraminal measurement less than 3 mm at L3 level was observed in 3 patients, at L4 level in 9 patients and at L5 level in 15 patients. Right side inter-vertebral foraminal measurement less than 3 mm at L3 level was observed in 2 patients, at L4 level in 14 patients and at L5 level in 9 patients. Left side inter-vertebral foraminal measurement less than 3 mm at L3 level was observed in 1 patient, at L4 level in 10 patients and at L5 level in 14 patients. Prolapsed inter-vertebral disc was common at L4/L5 level (43.6%) followed by L5/S1 (39.8%) and then at L3/L4 level (12%). Posterolateral prolapse was seen in 65.7% cases followed by central prolapse in 23.2% cases, lateral prolapse in 7.4% cases and migratory prolapse in 3.7% cases. **Conclusion:** It can be concluded from present cross-sectional study that maximum number of cases was observed in 31-50 years of age group and males was affected more compared to females. More than half of the cases diagnosed with inter-vertebral disc prolapse. Prolapsed inter-vertebral disc was observed more commonly at L4/L5 and L5-S1 level. Posterolateral prolapse was most commonly observed in the present study. **Key words:** CT myelography, lumbar canal stenosis, prolapsed intervertebral disc

*Address for Correspondence:

Dr Ganesh S Narwane, Resident, Department of Radio-Diagnosis, ACPM Medical College, Dhule, Maharashtra, INDIA.

Email: ganeshnarwane1@gmail.com

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INTRODUCTION

Approximately 5–15% of patients with low back pain suffer from lumbar disc herniation (LDH)^{1,2}. LDH is the most common spine disorder requiring surgical intervention^{3,4}. As lumbar canal stenosis and prolapsed intervertebral disc are very complex and challenging problems in clinical practice, a thorough evaluation of the patient, both clinically and radiologically is of utmost importance. Clinical guidelines recommend history taking and physical examination to rule out LDH diagnosis⁴.

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However, the diagnostic accuracy of both history taking and physical examination is still insufficient^{5,6}. Diagnostic imaging in patients with back pain and/or leg pain is often used to assess nerve root compression due to disc herniation or spinal stenosis and cauda equina syndrome⁷⁻¹⁰. Computed Tomography is a major advance and a revolutionary diagnostic technique in “Radiodiagnosis. It is a cross sectional imaging modality and allows direct visualization of the bony and soft tissue structures. Various studies have shown that CT of the spine has a high degree of reliability, specificity and sensitivity. It is commonly used in the screening of patients with clinically suspected degenerative diseases, fractures, congenital and neoplastic diseases of spine. CT myelography i.e. CT after administration of the intrathecal contrast is done to clearly delineate the bony anatomy, the cord and nerve compression. CT gives a three dimensional image of the spine, so the spinal diseases can be better evaluated. CT is a unique modality in the diagnosis of spinal stenosis. Thus present study was done to evaluate the role of CT Myelography in the diagnosis of Lumbar canal stenosis and Prolapsed inter-vertebral disc in rural population.

AMIS AND OBJECTIVES

To study of role of CT myelography in the diagnosis of lumbar canal stenosis and prolapsed intervertebral disc in rural population

METHODOLOGY

The present cross-sectional study was conducted with the aim to study the role of CT myelography in the diagnosis of lumbar canal stenosis and prolapsed intervertebral disc in rural population. For the purpose of study patients with clinical history of low backache and lower limb neurodeficit with probable lumbar canal stenosis or prolapsed inter-vertebral disc were selected for the study. Patients suffering from polyarthralgia, spinal tuberculosis, past history of lumbar disc surgery, and spinal/peripheral nerve injuries were not included. Cases with history of drug/food allergies, bleeding disorders, local skin infections, and patients on anticoagulant, antihyperglycemics, or antiepileptic drugs were also excluded A pilot study was conducted and 40% Prevalence of backache was observed. Considering the prevalence of backache 40% and allowable error 10% sample size was calculated by using Sample size calculation formula ($n = 4pq/l^2$). Thus the calculated sample size was 96 and it was round up 100. Thus total 100 participants were selected in the present study. Total 100 cases from rural population with clinical history of low backache and lower limb neurodeficit with probable lumbar canal stenosis or prolapsed inter-vertebral disc were taken up for CT scanning. Informed consents were obtained from all the

participants All patients underwent complete physical and neurological examinations including straight leg raising test, femoral stretch test, ankle/knee reflexes, motor and sensory examinations of both lower limbs. The spine was examined for tenderness and deformity.

RESULT

Table 1: Age wise distribution of study participants

Age group (Years)	No. Of patients	Percentage
<20	01	1
21-30	15	15
31-40	38	38
41-50	30	30
51-60	11	11
>60	05	5
Total	100	100

It was observed that majority of the patients i.e. 68 (68%) were in 31-50 years of age group. One patient below 20 years of age was enrolled in the study with traumatic lumbar canal stenosis.

Table 2: Gender wise distribution of study participants

Gender	No. of patients	Percentage
Male	65	65
Female	35	35
Total	100	100

It was seen that majority of the patients in the present study were male 65 (65%) with male to female ratio of 1.85:1.

Table 3: Distribution of study participants as per diagnosis

Diagnosis	No. of patients	Percentage
Lumbar canal stenosis	28	28
Prolapsed intervertebral disc	56	56
Lumbar canal stenosis and Prolapsed intervertebral disc	16	16
Total	100	100

It was seen that out of total 100 cases in the present study Lumbar canal stenosis was diagnosed in 28 cases, Prolapsed inter-vertebral disc was diagnosed in 56 cases and both Lumbar canal stenosis and Prolapsed inter-vertebral disc was diagnosed in 16 cases.

Table 4: Distribution of cases as per AP diameter and cross sectional area of thecal sac

Level	No. Of cases showing AP diameter 11.5 mm or less	No. Of cases showing thecal sac area 145 mm ² or less
L3	20	21
L4	22	29
L5	25	32

AP diameter 11.5 mm or less and thecal cross sectional area 145 mm² or less were considered as a criteria for canal stenosis. Canal stenosis was commonest at L5 level followed by L4 and L3. Considering the cross sectional thecal sac area less than 145 mm² or less as criteria, more patients were detected to have lumbar canal stenosis than AP diameter less than 11.5 mm alone as criteria.

Table 5: Distribution of cases as per abnormal inter-vertebral foramen measurements at lumbar level

Level	Both Inter-vertebral foramina	Right inter-vertebral foramen	Left inter-vertebral foramen
L3	3	2	1
L4	9	14	10
L5	15	9	14

Inter-vertebral foraminal measurement less than 3 mm was considered abnormal. Right and left (both) side inter-vertebral foraminal measurement less than 3 mm at L3 level was observed in 3 patients, at L4 level in 9 patients and at L5 level in 15 patients. Right side inter-vertebral foraminal measurement less than 3 mm at L3 level was observed in 2 patients, at L4 level in 14 patients and at L5 level in 9 patients. Left side inter-vertebral foraminal measurement less than 3 mm at L3 level was observed in 1 patients, at L4 level in 10 patients and at L5 level in 14 patients.

Table 6: Distribution of cases as per prolapsed inter-vertebral disc lesion in lumbar vertebrae

Level	No. of patients/ No. of Disc lesions*	Percentage
L1/L2	02	01.8
L2/L3	03	02.8
L3/L4	13	12.0
L4/L5	47	43.6
L5/S1	43	39.8
Total	108	100

* Multiple responses were observed

It was observed that Prolapsed inter-vertebral disc was common at L4/L5 level in 47 (43.6%) cases followed by L5/S1 I 43 (39.8%) cases and then at L3/L4 level in 13 (12%) cases.

Table 7: Distribution of cases as per site of prolapsed inter-vertebral disc

Type	No. of patients/ No. of Disc lesions	Percentage
Posterolateral	71	65.7
Central	25	23.2
Lateral	08	07.4
Migratory	04	03.7
Total	108	100

It was observed that Posterolateral prolapse was the commonest type of prolapsed intervertebral disc in the present study. Posterolateral prolapse was seen in 71 (65.7%) cases followed by central prolapse in 25 (23.2%) cases, lateral prolapse in 8 (7.4%) cases and migratory prolapse in 4 (3.7%) cases.

DISCUSSION

Computed Tomography has revolutionised the approach to the diagnosis of spinal diseases. It has become an investigation of choice in the diseases of spine. It has

proved to be of immense value in the evaluation of lumbar spinal canal stenosis and lumbar disc disease. 100 patients who were clinically suspected of having lumbar canal stenosis or prolapsed intervertebral disc were evaluated with CT Myelography. It was observed that majority of the patients were in the age group of 31-50 years of age. Similar findings were observed in the study conducted by the Dublin *et al.*¹¹ studied 106 patients and the average age was 43 years and Schipper *et al.*¹² had observed mean age of 43 years in their series of 461 patients. It was seen that majority of the patients in the present study were male 65 (65%) with male to female ratio of 1.85:1. Similar findings were also reported by Schipper *et al.*¹² in their study where out of 461 patients 61% were male, while Dublin *et al.*¹¹ also observed 64 men to 42 women in their series of 106 patients. Study conducted by the Sitansu Kumar Panda *et al.*¹³ observed that males were more sufferer than the females. It was seen that out of total 100 cases in the present study Lumbar canal stenosis was diagnosed in 28 (28%) cases, Prolapsed inter-vertebral disc was diagnosed in 56 (56%) cases and both Lumbar canal stenosis and Prolapsed inter-vertebral disc was diagnosed in 16 (16%) cases. Study conducted by the Ahmed Bakhsh *et al.*¹⁴ observed that stenosis in 11.29% patients. Inter-vertebral foraminal measurement less than 3 mm was considered abnormal. Right and left (both) side inter-vertebral foraminal measurement less than 3 mm at L3 level was observed in 3 patients, at L4 level in 9 patients and at L5 level in 15 patients. Right side inter-vertebral foraminal measurement less than 3 mm at L3 level was observed in 2 patients, at L4 level in 14 patients and at L5 level in 9 patients. Left side inter-vertebral foraminal measurement less than 3 mm at L3 level was observed in 1 patient, at L4 level in 10 patients and at L5 level in 14 patients. Study conducted by the Johansen JG¹⁵ had shown that CT measurements of lateral recess depth of 3 to 5 mm suggests stenosis, less than 3 mm definitely indicates stenosis. It was observed that Prolapsed inter-vertebral disc was common at L4/L5 level in 47 (43.6%) cases followed by L5/S1 in 43 (39.8%) cases and then at L3/L4 level in 13 (12%) cases. Study conducted by the Ahmed Bakhsh *et al.*¹⁴ observed that the most common site of lesion was L4-5 level (58.15%) followed by L5-S1 level (35%). Study conducted by the Sitansu Kumar Panda *et al.*¹³ observed that maximum number of herniation occurs at the level of L4 -L5 level. level. Anand and Lee¹⁶ in their series found the commonest site of prolapsed at L5/S1 and L4/L5 disc level. Gulati *et al.*¹⁷ found maximum disc prolapsed at L4/L5 and L5/S1 disc levels. Williams AL¹⁸ found disc prolapsed more common at L5/S1 level followed by L4/L5 level. Firooznia *et al.*¹⁹ found commonest prolapsed of discs at L4/L5 and L5/S1 levels. AP diameter 11.5 mm or less and thecal cross-sectional area 145 mm² or less were

considered as a criterion for canal stenosis. Canal stenosis was commonest at L5 level followed by L4 and L3. Considering the cross-sectional thecal sac area less than 145 mm² or less as criteria, more patients were detected to have lumbar canal stenosis than AP diameter less than 11.5 mm alone as criteria. Study conducted by the Sitansu Kumar Panda *et al.*¹³ observed that stenosis was noted mainly in vertebrae L4, L5 and S1. Study conducted by the Dorwart *et al.*²⁰ mentioned AP diameter less than 11.5 mm and thecal cross-sectional area of less than 145 mm² as the criteria for lumbar canal stenosis and out of the two, thecal cross-sectional area was more sensitive indicator of canal stenosis. It was observed that Posterolateral prolapse was the commonest type of prolapsed intervertebral disc in the present study. Posterolateral prolapse was seen in 71 (65.7%) cases followed by central prolapse in 25 (23.2%) cases, lateral prolapse in 8 (7.4%) cases and migratory prolapse in 4 (3.7%) cases. The posterior longitudinal ligament does not allow the disc to herniated centrally, while there is less support just lateral to posterior longitudinal ligament. So posterolateral herniation were more common. Study conducted by the Carrera *et al.*²⁰ had showed that the Posterolateral prolapse was most common disc herniation in their series of 32 patients. Study conducted by the Gaskill *et al.*²¹ observed that 60% patients had posterolateral herniation, 30% posterior (central) and 10% were lateral.

CONCLUSION

It can be concluded from present cross-sectional study that maximum number of cases was observed in 31-50 years of age group and males was affected more compared to females. More than half of the cases diagnosed with intervertebral disc prolapse. Prolapsed inter-vertebral disc was observed more commonly at L4/L5 and L5-S1 level. Posterolateral prolapse was most commonly observed in the present study.

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