Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: www.saspublishers.com

OPEN ACCESS

Orthopaedics

Assessment of Radiological and Prognostic Factors in cases of Lumbar Spinal Stenosis in a Sub Population of Patients at a Tertiary Care Hospital

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| **Received:** 04.04.2019 | **Accepted:** 14.04.2019 | **Published:** 30.04.2019
DOI: 10.36347/sjams.2019.v07i04.017

Abstract **Original Research Article**

Lumbar spinal stenosis (LSS) is a pathological clinico-radiological syndrome characterized by unilateral or bilateral lower limb pain, numbness, paraesthesia or weakness which may or may not be associated with correlating radiological findings and is usually associated with low back pain. Radiological indices measuring thecal sac dimensions do not correlate well with symptoms or surgical treatment in cases of LSS. A total of 50 patients with symptoms suggestive of LSS were enrolled in this study in 2014. Patients were subjected to history taking, clinical examination and radiological investigations. Outcomes of assessment were analysed using Oswestry Disability Index (ODI) and Japanese Orthopaedic Association Score (JOAS). Both variables were assessed to determine their correlation with multiple factors like age, sex, LSS at level of dural sac, lateral recess nerve root compromise, foraminal stenosis and JOA score. There was no statistically significant correlation between degree of stenosis in MRI and functional outcome of patient assessed by ODI & JOAS. Lack of clinico-radiological correlation in patients of LSS requires careful evaluation of clinical symptoms & MRI imaging to determine appropriate treatment strategy.

Keywords: Lumbar spinal stenosis, clinico-radiological syndrome, lateral recess nerve root compromise, dural sac, foraminal stenosis.

INTRODUCTION

Lumbar spinal stenosis (LSS) is a specific pathological clinico-radiological syndrome in which there is progressive narrowing of the spinal canal that causes unilateral or bilateral lower limb symptoms due to nerve root compression [1-4]. Accurate diagnosis of the clinical syndrome of spinal stenosis is important because of the substantial differential diagnoses and because the range of treatments includes spinal surgery, which is associated with some morbidity and treatment failure in the elderly population [5-8].

There has not been convincing evidence of a relationship between symptoms or surgical results and any anatomical measurement [7-12]. LSS may be congenital, acquired or combined and it is classified based on aetiology, stability, site of stenosis and anatomy [13]. It typically presents with neurogenic claudication or radicular pain but all patients with LSS are not symptomatic, and symptomatic LSS patients also differ in their need for conservative treatment vs surgery. Surgery is needed only for those patients with significant symptoms that do not respond to conservative treatment. The purpose of this study was to evaluate and assess the radiological and prognostic factors in patients with LSS, and determine the statistical significance of their correlation with other variables.

MATERIALS AND METHODS

This study was conducted at our institute from 2014-2016. After obtaining informed consent and institutional ethics committee approval, fifty patients were enrolled in the study. Patients presenting with symptoms suggestive of LSS in Orthopaedics outpatient department who met inclusion criteria & provided informed consent were subjected to history taking, clinical examination & radiological investigations.

The diagnosis of LSS was made by history, clinical examination & radiological investigations in which symptoms of LSS such as paraesthesia, numbness and weakness were considered. The diagnosis was confirmed by MR imaging which shows areas of canal stenosis and was classified as no/mild/moderate/severe stenosis on the basis of area of lumbar spinal canal at the level of intervertebral disc corresponding to the thecal sac.

Table-1: MRI based classification

No stenosis	Area of lumbar spinal canal	> 100 mm^2
Mild stenosis	Area of lumbar spinal canal	76- 100 mm^2
Moderate stenosis	Area of lumbar spinal canal	50-75 mm^2
Severe stenosis	Area of lumbar spinal canal	< 50 mm^2

Table-2: Study Inclusion Criteria

S. No.	Inclusion Criteria
1	Age group range from 40-70 years
2	Patients with signs & symptoms of LSS
3	Completed informed consent

Table-3: Study Exclusion Criteria

S. No.	Exclusion Criteria
1	Patients with similar symptoms as that of lumbar canal stenosis with vascular claudication.
2	Patients with similar symptoms as that of lumbar canal stenosis without neurogenic claudication.
3	Patients with single or multiple level fractures.
4	Patients with spinal malformations and developmental anomalies.
5	Patients previously operated for spinal surgery.
6	Patients who were administered epidural steroid injections.
7	Patients with X-ray findings suggestive of disease pathologies contributing to similar symptoms but not related to lumbar canal stenosis.
8	Patients having more than 100 mm^2 area at the level of dural sac on MRI.
9	Patients having preexisting neurological disorders.

Radiographic examination was done which included plain radiograph AP view, lateral view, right oblique view, left oblique view, flexion view, extension view. Standard MRI imaging was done. Detailed patient history was recorded and a questionnaire was filled. Clinical and prognostic outcome evaluation including ODI and JOA score were done, along with assessment of functional ability of selected patients. Subsequently patients were grouped according to age, gender; lumbar canal stenosis at level of dural sac, lateral recess nerve root compression, foraminal stenosis and each of their correlation was assessed with ODI and JOA score.

Outcome

All patients were assessed and evaluated using JOAS and ODI for prognostic and clinical outcome measures, and using MR imaging for radiological outcome measures in a prospective cohort study design.

Statistical analysis

Statistical analysis was performed using SPSS 20.0 (Statistical package of social sciences, Chicago, IL, USA) software.

Data were expressed as the ODI grade and absolute JOA score. Paired comparisons were made using Pearson's chi square test, and parameters calculated were Pearson's chi square value, p value and likelihood ratio. The significance level was set at p value less than 0.05.

Results

Thirty six female patients (72%) and fourteen male patients (28%) with mean age of 55 years (range: 40-70 years) participated in this study. Severity of ODI was mild in thirteen patients (27%), moderate in twelve patients (25%), severe in fifteen patients (30%), bedridden in two patients (5%) and crippled in eight patients (13%). Severity of JOA score was mild (18-23) in twenty six patients (52%), moderate (12-17) in thirteen patients (27%) and severe (6-11) in eleven patients (21%). Pearson's chi square test was applied to derive association between JOA score and ODI, and it was observed that this was not statistically significant ($p > 0.05$). No patients were lost in follow up.

Discussion

Lumbar spinal stenosis acts as a source of neurogenic claudication leading to bilateral or unilateral lower limb pain, numbness, paraesthesia or weakness [1-4]. Accurate diagnosis of LSS is important because it has multiple differential diagnoses, and because one of the treatment modalities includes spinal surgery which may lead to patient morbidity and treatment failure in the elderly population [5-8]. Absence of definite radiological signs poses a diagnostic challenge in cases of LSS. Due to the topography of the involved spinal canal's structure, LSS is either central canal stenosis or lateral recess stenosis. There is no method of assessment of the spinal canal based on pathological process localization relative to its topographical anatomy. Patients with LSS become symptomatic when the spinal cord or the nerves are compressed. The syndrome of spinal canal stenosis includes poorly localized bilateral lower extremity pain, numbness and weakness which is usually associated with low back pain. Magnetic resonance imaging has an important role in diagnosing conditions causing acute low back pain

and sciatica. It remains unclear whether MRI alone is sufficient to justify treatment for spinal stenosis or whether it is equivalent to CT or whether CT is better than MRI in this regard [14]. In current clinical practice, MRI scan is used routinely to diagnose LSS. Also measurements of spinal canal are better measured with MRI than CT [15].

Pekka Kuittinen P *et al*. [18] and Hughes a *et al*. [17] found in their study that the mean age of the patients was found to be 64 years and 62 years respectively. The study by Kuittinen P *et al*. [18] showed a female preponderance wherein the percentage of male population was 44% and that of females of 56%. [18].

Y. Ishimoto *et al*. [19] found in their study that the most common level of involvement was at L4-L5. In the study by Pawar I *et al*. [16] studying the lumbar canal on MRI in Indian population, the most common level of involvement having maximum degree of stenosis was found to be at the L5-S1 level.

Sirvanci M *et al*. [20] conducted a study to establish a relationship between the degree of radiologically established anatomical stenosis and the severity of self-assessed Oswestry Disability Index in patients undergoing surgery for degenerative lumbar spinal stenosis. The authors in the study concluded that lumbar spinal stenosis remains a clinico-radiological syndrome, and both the clinical picture and the MR imaging is needed with patients having this diagnosis. MR imaging has to be used to determine the levels to be decompressed.

In our study, 54% patients had mild stenosis while 25% and 21% patients had moderate and severe stenosis respectively. This is in agreement to the study by Y Ishimoto *et al*. [19] where the incidence of mild, moderate and severe stenosis was found to be 25%, 45% and 25% respectively, while in study by Sirvanci M *et al*. [20] the incidence of mild, moderate and severe stenosis was found to be 52%, 20% and 18% respectively.

It was observed that there is no statistically significant association between dural sac stenosis, lateral recess stenosis, foraminal stenosis, JOA Score and ODI. This is in agreement with the study done by Sirvanci M *et al*. [20], where no significant correlation was found between area of lumbar spinal canal, degree of lateral recess or foraminal stenosis and severity of ODI.

The study by Goni V *et al*. [21] also has results which are in accordance with our study where it was concluded that the area of lumbar canal at the level of dural sac does not have correlation with the severity of symptoms in patients of lumbar canal stenosis.

The present study has its own limitations. Firstly, no control group was used in this study. Also this was not a multicenter double blinded study. Subsequent randomized controlled trials with longer follow up period with a control group are needed. This study further supports the fact that the degree of stenosis in MRI and functional patient outcome assessed by ODI and JOA score has no statistically significant correlation.

CONCLUSION

No significant correlation exists between imaging appearances, levels of disability and functional outcomes in patients with LSS. Degenerative LSS is a clinico-radiological syndrome and the degree of lumbar canal stenosis did not correspond to the severity of ODI percentage disability. In order to evaluate and plan surgery in patients with LSS, both clinical symptoms and MR imaging are important, and MR imaging is used for determining the levels to be decompressed.

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