ORIGINAL ARTICLE

Low Back Pain in Adults: Pattern of Abnormal Findings on MRI Lumbosacral Spine Images in South-East Nigeria

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ABSTRACT

Background: Low back pain is a leading cause of musculoskeletal disability resulting in loss of productivity and frequent outpatient physiotherapy. Magnetic Resonance Imaging (MRI) allows detailed evaluation of the soft tissue and bony components of the lumbosacral spine. It also assesses abnormalities that may be associated with low back pain.
Objective: To document the frequency and most prevalent lumbosacral spine MRI findings in patients with low back pain.
Methodology: Three hundred archived MRI images of patients aged 18 years and above investigated for low back pain at Memfys hospital for Neurosurgery were evaluated in this study. Analysis of data was done using SPSS Software Version 21.0 for windows.
Results: The study population had a mean age of 53.9 years with a range of 18 to 91years. Positive findings were noted in 299(99.66%) of 300 subjects. Subjects aged 40 – 49 years (22.67%) were of the highest frequency followed by 50 – 59 (22.33%). Positive findings were neural foramina narrowing (96.33%), disc herniation (93.67%), disc dehydration (79%), canal stenosis (46.67%), vertebral degenerative changes (43%), scoliosis (19.67%), cord compression (11%), discitis (9%), vertebral fracture (7%), spinal mass (5.67%), vertebral mass (5%) and kyphosis (3.4%). Most prevalent findings were mainly in the 60 – 69 age group of male gender.
Conclusion: This study has demonstrated a high prevalence of abnormalities in lumbosacral MRI of patients with low back pain. The most prevalent findings were neural foramina narrowing, disc herniation and disc dehydration.

Keywords: *Imaging, Positive findings, Soft tissue, Bony components*

INTRODUCTION

Low Back Pain (LBP) is a leading cause of musculoskeletal disability, sometimes causing severe debilitating pain that may lead to loss of productivity, and also a frequently reported condition for which people receive outpatient physiotherapy.[1,2,3] It is usually accompanied by limitation of movement, often aggravated by physical activities and posture, and may be associated with referred pain and sciatica.[4,5] The prevalence of LBP has continued to increase in modern societies such as the UK, USA and Canada, with a reported rate of 39% in the UK and 21% in Hong kong.[6] A 12-month prevalence of low back pain of 44% is reported in a South-West Nigerian urban community, with the disorder being more prevalent among men (49%) than women (39%), highest among farmers (85%), and lowest among housewives (32%).[9] It is also associated with a history of trauma and low educational status. Prevalence of LBP from this Nigerian study report is comparable to levels recorded in industrialized countries.[9] However, another study done at a Nigerian rural peasant farming community shows a higher prevalence of 72.4% of participants reportedly experiencing LBP over a 12 months period, affecting more males (73.5%), than females (71.0%).[10]

Patients presenting with LBP may show non-specific clinical features, and the precise source of pain may be difficult to localize. Physicians may request a lumbo-sacral x-ray in the initial radiologic assessment of the patient. However, Magnetic Resonance Imaging (MRI) is increasingly being requested for assessment of the bony and soft-tissue components of the lumbo-sacral spine, including the cord in this group of patients. MRI has better soft tissue resolution compared with plain radiographs and Computed Tomography.[11] The modality is also able to fairly accurately diagnose degenerative, inflammatory, neoplastic and vascular bony disorders as well as complications involving the spinal canal, the cord and spinal nerves at the neural foramina. It is also free of ionizing radiation.[11]

This study aims to determine the frequency of occurrence of positive MRI findings in patients presenting with low back pain, specifically the presence of pathological bony features, spondylolisthesis, degenerative disc diseases, non-discogenic causes of low back pain, as well as features suggestive of spinal canal or cord pathology. It also hopes to determine the relationship between the possible individual MRI findings and patients' age, sex and other incidental pathological findings on lumbosacral MRI.

METHODOLOGY

This is a retrospective study of the MRI lumbosacral spine images of all patients presenting with LBP at Memfys hospital for Neurosurgery, Enugu, between January 1st 2013 and December 31st 2013. Images for three hundred patients who met the inclusion criteria were retrieved for this study.

The Protocol of Scanning the Lumbosacral Spine

An xBasda –PI (2009) 0.35Tesla MRI machine was used.

All patients were positioned supine on the scanning couch and a radiofrequency coil placed over patients, covering areas between the costo-phrenic angle and the iliac crest (region of the lumbar spine). Laser was aligned at midpoint between L1 and L3. Table was then moved under the magnet until patient was at the centre of the gantry.

Studies consisted of five spin echo-pulse sequences.

1. Coronal, sagittal and axial localizers with a repetition time and echo time (TR/TE), Field of view (FOV) of 352 x 352cm,
2. Sagittal images with TR/TE 400/20 msec, FOV 352 x 352 cm,
3. Axial images with TR/TE 400/20 msec, FOV 352 x 352 cm
4. Sagittal images with TR/TE 3000/120 msec, FOV 352 x 352 cm
5. Axial images with TR/TE 3000/120 msec, FOV 352 x352 cm

A slice thickness of 5mm with 1mm gap was used for all sequences.

The sagittal images covered the entire width of the spine including the neural foraminae. The axial images were acquired parallel to the discs and covered the adjacent margins and endplates of the adjacent vertebral bodies.
Intravenous contrast agent, Magnevist® (gadolinium) was administered 0.2ml/kg for cases of spinal or vertebral mass, followed by acquisition of T1W sagittal, axial and coronal images.

The MRI images were evaluated by a radiologist and the recorded MRI findings were entered into a pre-designed data sheet.
For purposes of this study, lumbar canal stenosis was defined as antero-posterior dimension of lumber spinal canal of less than 11.5mm (Irurhe, *et al.*)[11], measured from posterior margin of the intervertebral disc to the spino-laminar junction (Irurhe, *et al.*) Others were: features of posterior disc herniation, presence of vertebral mass, vertebral compression fracture, retrolisthesis, spinal mass, osteophytes, kyphosis, scoliosis, postero-lateral disc herniation and foraminal narrowing; measured on the para-sagittal images.
Patients' bio data including age and gender were sought from hospital records and also entered into the aforementioned data sheet.

MRI images for individuals below the age of 18 years, pregnant females and those that have undergone surgical treatment for low back pain were excluded from the study.

Data analysis was done using statistical package for the social sciences (SPSS) software, IBM Corp, Released 2012, IBM SPSS statistics for windows, version 21.0 Armonk NY: IBM Corp.

RESULTS

Three hundred subjects were recruited for this study. Age of patients ranged from 18 – 91 years with a mean of 53.9 years. Positive findings were noted in 299 (99.66%) of 300 subjects. Subjects aged 40 – 49 years (22.67%) were of the highest frequency followed by 50 – 59 (22.33%) then the least percentage was for 90 - 99 (0.2%), see figure 1. Positive findings were neural foramina narrowing (96.33%), disc herniation (93.67%), disc dehydration (79%), canal stenosis (46.67%) vertebral degenerative changes (43%), scoliosis (19.67%), cord compression (11%), discitis (9%), vertebral fracture (7%), spinal mass (5.67%), vertebral mass (5%) and kyphosis (3.4%), as shown in Table 1. Gender distribution for the findings on MRI Lumbosacral spine is shown in Table 2. Only the gender difference in canal stenosis and vertebral masses were found to be statistically significant (*p*-value 0.004 and 0.03 respectively). Age distribution for the most prevalent findings is shown in Table 3.

Figure 1. Age distribution of study population

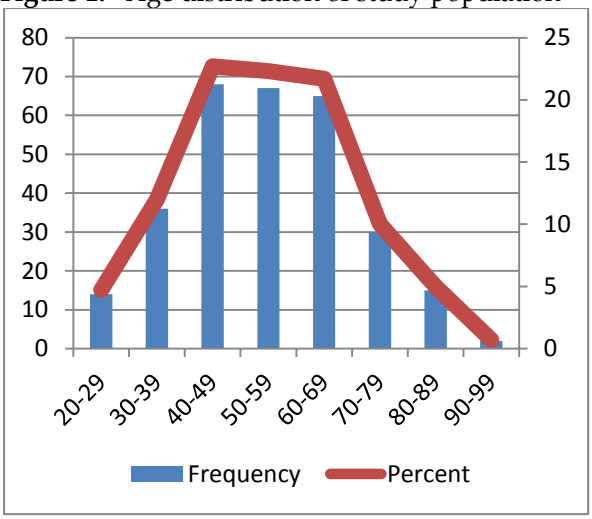

Table 1. Frequency distribution of lumbo-sacral MRI findings for study population

S/N	MRI FINDINGS	FREQUENCY	%
1	Comparative neural foramina narrowing	289	96.33
2	Postero-lateral disc herniation (96.4% multilevel)	281	93.67
3	Disc dehydration (disc degenerative changes)	237	79.00
4	Canal stenosis	134	46.67
5	Vertebral degenerative changes	129	43.00
6	Scoliosis	59	19.67
7	Cord compression	33	11.00
8	Features of discitis	27	9.00
9	Vertebral fracture	21	7.00
10	Spinal mass	17	5.67
11	Vertebral mass	15	5.00
12	Kyphosis	12	4.00

Table 2. Gender distribution for the findings on MRI lumbo-sacral spine

MRI FINDINGS	GENDER		TOTAL	X^{2*}	*P* - value
	MALE	FEMALE			
Kyphosis	6	6	12	0.011	0.915
Scoliosis	33	26	59	0.577	0.448
Spinal mass	10	7	17	0.386	0.535
Disc degeneration	143	137	280	0.596	0.440
Foramina narrowing	147	142	289	2.028	0.154
Canal stenosis	57	77	134	8.082	0.004
Cord compression	19	14	33	0.518	0.472
Vertebral fracture	11	10	21	0.007	0.934
Vertebral mass	12	3	15	4.075	0.03
Discitis	14	13	27	0.000	0.984
Disc dehydration	122	115	237	0.016	0.898
	574	550	1124		

*$x^{2=}$ chi square test *p* -value ≤ 0.05 is significant

Table3. Age distribution for the most prevalent findings on MRI lumbo-sacral spine

MRI Findings	**No of Patients**	**AGE GROUP (IN YEARS)**							
		<20 %	20- 29 %	30-39 %	40-49 %	50-59 %	60-69 %	70-79 %	≥80 %
Narrowed Foramen	289	0.7	3.5	11.8	23.2	22.5	22.2	10.4	5.9
PLD	281	0.4	3.0	11.0	22.8	23.1	22.8	10.7	6.1
Disc degeneration	237	0	0.9	10.1	18.1	25.3	26.2	12.2	7.2
Canal stenosis	134	0.9	3.0	8.2	16.4	25.4	26.9	11.2	8.2
Vertebral Degenerative changes	129	0.8	0.8	0	13.2	24.8	32.6	20.9	7.0
Cord compression	33	3.0	15.2	15.2	12.1	18.2	15.2	9.1	12.1

DISCUSSION

Low back pain is often attributed to disc degeneration, which is the primary target for many diagnostic approaches. However, the importance of imaging findings associated with disc degeneration (osteophytes, disc narrowing and herniation) remains unclear. Muscular and ligamentous sources of pain may be equally important.[12] Although the differential diagnosis of LBP is broad, the vast majority of patients seen in primary care will have non-specific LBP, with no neoplastic, infectious or primary inflammatory cause.[12] Among all primary care patients with LBP, less than 5% will have serious systemic pathology.[12]

This study showed that the mean age for presentation with LBP is 53.9 (18 – 91 years) which is comparable to the 54.5% reported by Irurhe, *et al*. but higher than the 42 years by Yong, *et al*., despite similar age range with that in this study.[11,13] Two hundred and ninety nine (99.66%) patients in this study had objective evidence of pathology on MRI while in 01 (0.34%) patient, the MRI examination was normal. This is higher than that by Surendra, *et al*. in which 206 (88.8%) patients with LBP had positive MRI findings while 23(11.2%) had normal MRI examinations. [14]

This study shows males to be more affected than females for some of the findings namely neural foramina narrowing, posterolateral disc herniation, disc degenerative changes and cord compression; while females are more affected than males in canal stenosis and vertebral degenerative changes, though statistical significance between males and females was found only in canal stenosis and vertebral masses. The gender distribution seen in this study, 51.6% males and 48.33% females differs from other studies such as Irurhe, *et al*. who reported 65.5% males and 34.5% females, Mustapha, *et al*. 65.8% males and 34.5% females, Uduma, *et al*. 60.4% males and 39.6% females and Sreedhar, *et al*.[15,16,17] from a smaller population (42 subjects) with 71.19% males and 28.81% females.

The highest number of patients was found to be in the 5th decade 22.67%. Similar results were found in the study by Irurhe, *et al*. but other authors reported the 4th decade as having the highest frequency.[15,18]

This study revealed neural foramina narrowing (96.33%) as the commonest MRI finding in these patients with low back pain followed by posterolateral disc herniation (93.67) and disc dehydration (79%). This differs from findings in the study by Endean *et al.* where disc protrusion is the most prevalent followed by disc degeneration and high intensity zones(HIZ)/annular tear and in study by Irurhe *et al*. where disc desiccation was most common followed by disc height reduction then disc herniation.[19] Some studies done in Nigeria and Cameroun also differed in their findings where disc prolapse was the commonest MRI finding.[15,16]

Yong, *et al*. also demonstrated in 56 patients with LBP that disc degeneration occurred commonly in MRI images of Japanese. Also studies done in asymptomatic patients have revealed disc herniation and disc bulge as the most prevalent MRI findings.[20,21,22] Some authors reported reduced disc signal as the most prevalent findings on MRI lumbosacral image though one of the studies was in 13 – year old children.[23,24,25]

All these differences in the most common MRI findings may be due to varying age ranges and racial differences.

CONCLUSION

This study has demonstrated a high prevalence of abnormalities in lumbosacral MRI images of patients with low back pain. The most prevalent findings were neural foramina narrowing, disc herniation and disc dehydration. Lumbosacral spine MRI is highly recommended for all patients presenting with low back pain.

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