Spectrum of Lumbar Spine Pathologies in Patients with Low Back Pain on MR Examination: A Retrospective Hospital Based Study.

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ABSTRACT

INTRODUCTION: Low back pain is one of the commonest symptoms encountered in clinical practice today. Plain x-ray has traditionally been used as an initial screening test, however, with low diagnostic outcome. Though, CT scans have been used in the past to assess the spinal pathologies, today CT has almost completely been replaced by MR imaging due to the latter’s superior contrast resolution and multiplanar capabilities. This study aims to show the spectrum of pathology as the cause of Low Back Pain with the help of MRI scan.

METHODS: A total of seven hundred and twenty two lumbar spine MR scans performed at four diagnostic centers in Kathmandu were studied over a period of three consecutive months. Findings were obtained from the computer data base from these centers and analysed retrospectively.

RESULTS: Majority of the patients, representing about 45.7% were in the age group bracket of 21 to 40 years, with a slight male preponderance of 53.9%. The most common pathology encountered was degenerative changes of the spine, of which intervertebral disc bulge accounted for 50.1 %, spondyloitic changes made up 15%, disc dehydration, 6.7% and disc herniation constituted 2.0%. Spinal canal stenosis was present in 5% of patients. Spinal masses were mainly haemangiomas constituting about 3.6% and infection being the least common with only about 2.3% of cases. Interestingly, substantial number of patients (9%) showed normal MRI findings.

CONCLUSION: Most common spinal pathology in patients with low back ache was degenerative changes of the spine, which is being encountered more commonly in younger age group. MRI imaging, though expensive is beneficial in early diagnosis and management of lumbar spine abnormalities.

KEY WORDS:

INTRODUCTION:

Patients with low back and lower extremity pain commonly have imaging studies to elucidate the cause of the pain and rule out a structural abnormality. Traditionally, plain film radiography has been the initial screening imaging test, but the yield of this technique is low(1-4). In Nachemson’s (1) series of 68,000 conventional lumbosacral spine examinations, clinically unsuspected positive findings were obtained only once in 2,500 radiographic examinations. During the past decade, CT has been largely supplanted by MR imaging for the assessment of lumbar back pain because of its multiplanar format, superior contrast resolution, and improved assessment of the L5-S1 level(4-8).

Magnetic Resonance Imaging is the optimal imaging modality to evaluate patients with low back pain for the early detection of disease process, to assess the response to treatment and to plan out surgical procedures. With its excellent soft tissue resolution, the exact nature of the disease as well as its extent of involvement can be thoroughly assessed.
We performed this study to explore the spectrum of pathologies encountered in patients with low back pain in four different diagnostic (MRI) centres in Kathmandu, Nepal.

**METHODS:**

There were a total of two thousand three hundred eighty-four MR scans performed for various pathologies at Diagnostic Imaging and Research Centre, Blue Cross Diagnostic Centre, B & B hospital and Shree Birendra Hospital during the period of three months from Falgun 2067 to Baisakh 2068. Out of which only the contrast enhanced lumbar spine MRI performed in these centers during that particular period were included in this study. All the patients included in the study were referred by physicians to investigate the cause of low back ache. All seven hundred and twenty-two patients were included in this study. All the patients included in the study were referred by physicians to investigate the cause of low back ache. All seven hundred and twenty-two consecutive patients were selected from the database of MR examinations performed at these centers. Each scan was evaluated retrospectively by the authors.

Patients from all age groups were included. Patients with history of previous lumbar surgery were excluded from the study. Patients with non MRI friendly implants were also excluded from the study.

 Patients were subjected to multiplanar MR imaging from the first lumbar to the first sacral vertebra. T1W and T2W axial, sagittal, coronal images along with STIR images were obtained. Axial images were taken at the level of the intervertebral discs.

Disc configuration was graded as normal, disc bulge or herniation or a combination of disc bulge and herniation. Herniated nucleus pulposus was considered to be an extrusion, mainly focal, of disc material beyond the osseous confines of the vertebral body, resulting in displacement of epidural fat, nerve root, or thecal sac. A bulge was defined as a diffuse, usually non-focal protrusion of non-osseous material beyond the normal disc space. Degeneration of the disc was considered to be present when there was loss of height of the disc space and a decreased signal on T2-weighted sequences.

Disc height, disc desiccation, Schmorl’s node, degenerative disease-induced bone marrow change, annular tear, osteophyte formation, nerve root displacement and swelling, narrowing of the intervertebral foramina, facet joint degenerative changes, and spinal stenosis were assessed as present or absent. Narrowing of the intervertebral foramen (loss of intervertebral fat and perineural encroachment) was assessed primarily on the sagittal images.

Degenerative changes of the facet joints (overgrowth of the superior facets, joint space narrowing, bone thickening and osteophyte formation) were assessed primarily on the axial images.

Lumbar foraminal stenosis was considered as the narrowing of the bony exit of the nerve root caused by a decrease in the height of an intervertebral disc, osteoarthritic changes in the facet joints, cephalad subluxation of the superior articular process of the inferior vertebra, and buckling of the ligamentum flavum or protrusion of the annulus fibrosus.

Further note was made for the presence or absence of spinal masses, evidence of infection or any associated pathologies.

**RESULTS:**

Table 1 Distribution of cases in different centers

<table>
<thead>
<tr>
<th>Site of MRI</th>
<th>Number of MRI done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI of the spine</td>
<td>958</td>
</tr>
<tr>
<td>MRI of organs other than spine (Brain, Joints etc.)</td>
<td>1426</td>
</tr>
<tr>
<td>Total</td>
<td>2384</td>
</tr>
</tbody>
</table>

Out of the total number of cases amounting to two thousand three hundred and eighty-four, nine hundred and fifty eight cases (40.2%) underwent MRI of the spine and one thousand four hundred and twenty six patients (59.8%) were scanned for other organs (i.e. brain, joints).
Table 3. Distribution of cases according to body parts in different centers

<table>
<thead>
<tr>
<th></th>
<th>DIRC</th>
<th>Bluecross</th>
<th>B &amp; B</th>
<th>Army Hospital</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical Spine</td>
<td>41</td>
<td>82</td>
<td>1</td>
<td>49</td>
<td>173</td>
</tr>
<tr>
<td>Dorsal Spine</td>
<td>15</td>
<td>20</td>
<td>13</td>
<td>15</td>
<td>63</td>
</tr>
<tr>
<td>Lumbar Spine</td>
<td>139</td>
<td>296</td>
<td>159</td>
<td>128</td>
<td>722</td>
</tr>
<tr>
<td>Total Spine</td>
<td>195</td>
<td>398</td>
<td>173</td>
<td>192</td>
<td>958</td>
</tr>
</tbody>
</table>

Out of nine hundred and fifty eight spinal MRI scans, lumbar spine scans were the most common, seven hundred and twenty two which is (75.4%) followed by cervical spine, one hundred and seventy three cases (18%). Dorsal spine accounted for only sixty three cases (6.6%).

Of the total of seven hundred and twenty two lumbar spines evaluated, one hundred and thirty nine were from DIRC, two hundred and ninety six from Blue cross, one hundred and fifty nine from B&B and one hundred and twenty eight from Shree Birendra hospital.

Table 4. Distribution of cases according to age groups in different centers

<table>
<thead>
<tr>
<th>Age of patient</th>
<th>DIRC</th>
<th>Bluecross</th>
<th>B &amp; B</th>
<th>Army Hospital</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20 Yrs.</td>
<td>21</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>37</td>
</tr>
<tr>
<td>21 - 40 Yrs.</td>
<td>131</td>
<td>68</td>
<td>78</td>
<td>53</td>
<td>330</td>
</tr>
<tr>
<td>41 - 60 Yrs.</td>
<td>101</td>
<td>46</td>
<td>61</td>
<td>47</td>
<td>255</td>
</tr>
<tr>
<td>61 - 80 Yrs.</td>
<td>43</td>
<td>18</td>
<td>13</td>
<td>23</td>
<td>97</td>
</tr>
<tr>
<td>&gt; 81 Yrs.</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>296</td>
<td>139</td>
<td>159</td>
<td>128</td>
<td>722</td>
</tr>
</tbody>
</table>

Majority of the patients were in the age group of 21-40 years (45.7%) and least in the age group of more than 81 years (0.4%). There is a slight male preponderance (53.9%).

Table 5. Distribution of patients according to sex

<table>
<thead>
<tr>
<th>Sex of patient</th>
<th>DIRC</th>
<th>Bluecross</th>
<th>B &amp; B</th>
<th>Army Hospital</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>83</td>
<td>153</td>
<td>82</td>
<td>71</td>
<td>389</td>
</tr>
<tr>
<td>Female</td>
<td>56</td>
<td>143</td>
<td>77</td>
<td>57</td>
<td>333</td>
</tr>
<tr>
<td>Total</td>
<td>139</td>
<td>296</td>
<td>159</td>
<td>128</td>
<td>722</td>
</tr>
</tbody>
</table>

Table 6. Distribution of spinal pathologies

- Proplase / Bulge 362
- Spondylosis 108
- Normal 65
- Disc Dehydration 49
- Infection 16
- Spinal Stenosis 36
- Mass (Haemangioma) 26
- Herniation 21
- Others (#) 39
- Total 722 (100%)

A total of sixty five MRI scans (9%) were interpreted as being substantially normal. The most common abnormality seen was disc prolapse/bulge (362 cases which is 50.1%) followed by lumbar spondylosis (108 cases which is 15%) and disc dehydration (49 cases which is 6.7%). Infection accounted for the least common pathology (16 cases which is 2.2%).

DISCUSSION:

Low back pain is an important clinical, social, economic, and public health problem affecting the population indiscriminately. It is a disorder with many possible etiologies, occurring in many groups of the population, and with many definitions(9). Most of the acute episodes maybe self limiting however, for patients with chronic pain or with worsening symptoms diagnostic imaging becomes a necessary tool to arrive at a definite diagnosis and start a more focused treatment. Magnetic resonance imaging (MRI) is now considered as the modality of choice in spinal pathology compared to all other radiographic...
modalities and disc herniation (protrusion or worse), nerve root deviation/compression, disc degeneration and high intensity zone (HIZ) has been commonly linked with low back pain (10). The precise diagnosis is still a challenge to the treating physician as most of these spinal abnormalities can be found in the absence of symptoms, and many patients with back complaints do not exhibit any demonstrable pathology on MRI (9).

The magnitude of the problem can be estimated by the fact that in United states alone it is estimated that the life time prevalence of low back pain is approximately 80% which means 31 million Americans suffer from low back pain at some point of their lives. The extensive search did not reveal any such data in Nepalese population however it is assumed that even in our country approximately two-thirds of individuals suffer from low back pain at some point during their lives, most commonly between the ages of 30 and 50 years (11). The present cross sectional study is a first in this population group which aim to identify the MRI findings and the possible causes of low back pain.

The most common cause of low back pain is related to some form of spinal degeneration. Imaging studies may be needed to assess the entire lumbar motion segment, including the intervertebral disc, facet joints, and vertebral body endplates. Magnetic resonance imaging is the best examination to provide such information noninvasively. Degenerative processes may affect the disc or other support structures and may occur as acute, subacute, or chronic problems. Manifestations of degenerative disc disease by imaging include disc space narrowing, loss of T2 signal intensity from the disc space, fissures, fluid, vacuum changes, calcification, ligamentous changes, marrow changes, herniation, osteophyte formation, malalignment, and stenosis (12).

Ageing and degenerative disc disease may be similar, although degenerative changes occur more rapidly (13). Spondylosis deformans, which is thought to represent normal ageing, predominantly affects and involves the annulus fibrosis and adjacent apophyses. Intervertebral osteochondrosis is also considered to be pathologic, involving the nucleus pulposus and vertebral body endplates. Extensive annular fissuring is also present. Anterior and lateral osteophytes, part of normal aging, are found in essentially all people over the age of 40, while posterior osteophytes are less common, suggesting a degenerative or pathologic process (14).

In our study, degenerative changes of the spine constituted majority of the patients, with intervertebral disc bulge or prolapse being the most common pathology, followed by degenerative changes of the vertebral body itself.

Disc dehydration, seen as loss of normal hyperintense signal intensity in T2W images was the third most common finding, which itself represents degenerative changes.

It is worth noting here that substantial number of patients with history of low back pain showed normal findings in MR scan. This group of individuals are most likely to represent acute muscle sprain which itself is self limiting.

Stenosis refers to narrowing of the spinal canal or neural foramina (15). Stenosis can be either acquired or developmental in nature with symptoms including low back pain, weakness, sensory symptoms, and relief with positional changes. Majority of the stenosis was due to intervertebral disc bulge or herniation causing either foraminal stenosis, stenosis of lateral recess or the spinal canal itself leading to compression of nerve roots or the spinal cord. Spondylotic changes of the vertebral bodies with formation of osteophytes as well as hypertrophy of the synovial joint and ligamentum flavum reduced the canal even further. Superimposed degenerative changes with a developmentally narrowed spinal canal can worsen symptoms. Typical findings on MR imaging were out of proportion to clinical presentation (16). The degree of stenosis can change with flexion, improving the degree of narrowing by 11%, and worsening with extension by 11% (17). In present study spinal stenosis was seen in 36 (5%) of patients and represents the severe form of spinal pathologies.
Most common spinal mass encountered in the study was haemangioma of the vertebral body, seen as hyperintensity in both T1W and T2W sequences with typical polka dotted appearance on axial scans and hypointense vertical trabeculation on sagittal images. This finding is consistent with the result found by Laredo et al (18).

Infective spondylitis accounts for approximately 2-7% of all cases of osteomyelitis(19). Incidence of spinal infection in our study was very low, accounting for only 16 (2.2 %) patients. This could be due to the fact that the study was conducted on an urban population where comparatively, the socio-economic status is higher than the rural population. Also the fact that the MR scan is still an expensive imaging tool not affordable and accessible to people from the lower socio-economic strata and so, this may not reflect the true incidence of pathologies in the whole of the country.

CONCLUSION:

The most common pathology encountered in patients with low back ache was degenerative changes of spine, either of the intervertebral disc or vertebral body or both, with some progressing to spinal canal stenosis. Spinal masses and infection were observed in minority of the population. Substantial number of patients showed normal MR findings, emphasizing the need to thoroughly examine the patients before requesting for an expensive imaging tool. This being a small retrospective study, we also feel the need to carry out a large hospital based study in the future to more accurately reflect the incidence of lumbar spine pathologies in our country.

REFERENCES: