Original Article

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MRI Findings of Non-Degenerative Pathoanatomical Changes in Low Back Pain

Non-degenerative pathoanatomical changes are far less common than degenerative changes but benefits most from imaging assessment. This study aimed to evaluate the non-degenerative pathoanatomical changes in patients undergoing MRI for low back pain.

The study was a retrospective study conducted for the duration of 3 years in a multimodality-imaging center. All patients undergoing MRI of lumbosacral spine with complains of low back pain with or without radiculopathy were assessed for morphological changes and other abnormal findings. After excluding patients with degenerative changes, non-degenerative pathologies were evaluated. Data was entered in predesigned proforma and analysis was done with SPSS 21.0.

There were 183 patients who met the inclusion criteria and were included in the study. The mean age of the patients was 51.23 ±16.86 years. Compression fracture of the vertebra was the most common non-degenerative changes accounting for 34% cases followed by spinal meningeal cysts (26%) and infection (14%). Fractures were more common in upper lumbar level as compared to lower lumbar levels. Meningeal cysts were noted to involve the sacral spinal canal more frequently followed by lower lumbar levels. Infective lesions were equally distributed throughout the lumbar spine. Hemangioma was common lesion involving 16% of cases. Lumbosacral transitional vertebra was seen in 7(3.8%) patients.

The common non-degenerative pathoanatomical changes associated with low back pain were traumatic lesion, infection, neoplastic lesion and lumbosacral transitional vertebra.

Key Words: compression fracture of vertebra, low back pain, MRI, spinal miningeal cyst, spondylodiscitis

Low back pain results in huge economic impact on the country due to prolonged loss of function resulting in loss of work productivity, treatment cost and disability payments.[7] After detailed history and clinical assessment, the causes of low back pain can be classified as non specific low back pain, back pain associated with radiculopathy or spinal stenosis, back pain referred from a non spinal source and back pain secondary to a specific spinal causes.[10] Patients with back pain associated with radiculopathy and spinal stenosis and back pain secondary to specific spinal causes are the one who benefit most from a MRI evaluation. Though less common, non-degenerative changes including traumatic lesion, neoplastic lesions and infections, benefit most from early diagnosis. Imaging

in patients with low back pain is only recommended when suspicious of disc herniation infection, fracture, malignancy or when invasive intervention is planned.[2]

MRI is more sensitive than CT for non degenerative pathologies like infection and primary and metastatic neoplastic lesions.[4] This study aims to identify the non-degenerative pathoanatomical alteration in patients undergoing MRI for low back pain with or without radiculopathy.

Material and Methods

The study was a retrospective institutional record based study conducted reviewing MRI done for the duration of 3 years from May 2010 to May 2013. The center of the study was Kathmandu Imaging, a multimodality-imaging center in Kathmandu, Nepal. The population of study was all symptomatic patients with low back pain with or without radiculopathy undergoing MRI of lumbosacral spine in the center during the study period.

MR images were acquired by 0.35 Tesla Siemens MRI machine (Magnetom C). The MRI images of the symptomatic patients were obtained by medium and large sized body coil with read matrix of 256. Images were acquired in sagittal plane in T1 weighted spin echo (Repetition time (TR)/ Echo time (TE) -400/12) and T2 weighted spin echo (TR/TE -4240/136) with slice thickness of 5 mm; gap of 20% of slice thickness and FOV of 320 mm. Images were also obtained in axial plane in T1 weighted spin echo (TR/TE - 578/ 13) and T2 weighted spin echo (TR/TE - 5610/131) with slice thickness of 5 mm; slice gap of 10 % of slice thickness and FOV of 230 mm. Coronal images and Short Tau Inversion Recovery (STIR) sequences were acquired in some cases for further evaluation.

Three radiologists, one of them with more than 10 years experience in Spine MRI, reported the MRI images with mutual consensus in disputed issues.

The imaging findings were recorded and plotted in SPSS data sheet. And statistical analysis was obtained from SPSS version 19.

Results

Out of 2037 MRI performed for chronic low back pain, there were 183 patients included in the study. The mean age of the patients was 51.23 ±16.86 with median of 51 and interquartile range of 25 years. There were 53.6% male patients and 46.4% females.

Table 1 shows that the most common non-degenerative changes noted was traumatic lesions in one third of the patients (33.9%). Traumatic lesions of the lumbar spine included compression/burst fracture, osteoporotic collapse of vertebra, reduced vertebral height and wedge compression fracture of the vertebra. The traumatic lesion was followed by spinal meningeal cysts 26.2%.

Non degenerative pathologies	Number (%) N=183
Traumatic lesions	62(33.9)
Spinal meningeal cysts	48(26.2)
Hemangioma of vertebra	31(16.9)
Infection	26(14.2)
Neoplastic Lesion	19(10.4)
Lumbosacral Transitional Vertebra	7(3.8)
Diffuse marrow signal change in vertebra	6(3.3)
Scoliosis	10(5.5)
Khyphosis	4(2.2)

Table 1: Non-degenerative pathologies of Lumbar spine in symptomatic patients.

The mean age of patients with traumatic lesions was 59.65 ± 16.46. Male and female distribution did not differ from the population with 53.2% males and 46.8% females. Traumatic lesions were more frequent in upper lumbar level than lower lumbar levels **(Table 2)**. Central spinal canal stenosis was noted only in 9.7% of all cases with traumatic lesions.

Pathology	**L1**	**L2**	**L3**	**L4**	**L5**
Traumatic lesions	34 18.6%	22 12.0%	9 4.9%	6 3.3%	8 4.4%
Infection	7 3.8%	7 3.8%	7 3.8%	9 4.9%	10 5.5%

Table 2: Distribution of traumatic and infective lesion in lumbar spine.

Spinal meningeal cysts were second only to fractures of the lumbar spine. The mean age of patients with spinal meningeal cyst was 46.0 ± 16.7 years. Male to female distribution was similar to the population of study with 52.1% male and 47.9% females. Spinal meningeal cysts were most common in the sacral region (72.9%) followed by lower lumbar levels (16.7%).

Infective lesions included in the study were spondylodiscitis, which were diagnosed on MRI based upon involvement of intervertebral disc, adjacent vertebral body and endplate with or with or without paravertebral and epidural collection. Infective lesions were present in 14.2% of patients in our study. The mean age of infective lesion was 45.27 ± 19.83 years years with equal males and females. Infective lesions were equally distributed in

the vertebral levels as well **(Table 2)**. Epidural component was noted in 13(50%) cases with mild to moderate central spinal canal stenosis however with no definite evidence of nerve root compression or conus medullaris (spinal cord) compression. There was involvement of multiple vertebral levels in 42.6% patients with infective lesions. Rest of the lesions involved disc and only one adjacent vertebral end plate.

Neoplastic lesions included 63.2% lesions involving vertebrae, 21.0% intradural extramedullary lesions suggestive of nerve sheath tumors and 15.8% intramedullary lesions of the spinal cord (conus medullaris). The mean age of patients with neoplastic lesion was 49.4 ± 16.5 years. Male was predominant gender having neoplastic lesions with 68.4% males and 31.6% females which was statistically significant at $P<0.05$ ($\chi 2=4.58$ $p=0.03$) with odd's ratio of 4.34.

Lumbosacral transitional vertebra was seen in 3.8% patients, which occurred along with other non-degenerative lesions. Scoliosis was seen in 5.5% cases, and kyphosis was noted in 2.2% cases.

Discussions

Most patients with low back pain cannot be given an exact pathoanatomical diagnosis and non-specific terms like sprain, strain or degenerative changes are commonly used. Other less common though important cause of low back pain are traumatic or osteoporotic fractures, neoplasia, infection, inflammatory arthritis, and congenital causes like scoliosis.[4]

Traumatic lesions were the commonest non-degenerative lesion in humbosacral instead LS spine. Jarvik & Deyo showed that traumatic lesions including compression fractures account for up to 4% of cases of low back pain. In our study, traumatic lesions were present in 62 out of 2037 i.e. 3% of all low back pain cases.[8] Compression fractures in traumatic lesions were common in older patients more than 50 years with osteoporosis and 30% patients had history of trauma.[8] This was concordant with our finding of mean age of 59 years in patients with traumatic lesions.

Spinal meningeal cyst was second only to traumatic lesions in our study. However spinal meningeal cysts are considered a rare entity causing back pain.[13] The commonest level of involvement in our study was the sacral region followed by lower lumbar region. Patients in our study had a mean age of 46 years, which might be the reason for lumbosacral predominance.

Lumbar spine is the most common site of hematogenous infective spondylodiscitis.[6] Infective spondylodiscitis represented only about 0.01% of patients with chronic low back pain in primary care setting.[8] However in our study the incidence is slightly higher with infection representing 1.3% of all low back pain cases, this probably represent the geographic variation in incidence of infective spondylodisctits. Spondylodiscitis preferentially affects males with male to female ratio of 1.5:1.14 However in our study the distribution among males and females were equal. MRI is the imaging modality of choice for diagnosis of spondylodiscitis with reported sensitivity and specificity above 90%.[6] Inflammatory changes in adjacent soft tissue, disc enhancement and high signal intensity in intervertebral disc are MRI signs with sensitivity of more than 90%. Involvement of one intervertebral disc with destruction of adjacent two endplates has 100% sensitivity for spondylodiscitis.[14] Early in the course of disease there is occasionally involvement of only one vertebral body.[8] In our study there was involvement of two or more vertebral body in half the cases with early disease involving only one vertebral body in half the cases.

Neoplastic lesions included primary neoplastic lesions of the vertebra, intramedullary lesions and extramedullary intradural lesions like nerve sheath tumors. Bony neoplastic lesion of the vertebra (63% of all neoplastic lesions) was the most frequent in the lumbar spine while intramedullary lesion was the least common. Hemangioma was noted in 17% cases in this study and all the cases had MRI features suggestive of inactive lesion with no feature of bony expansion or destruction. According to Garg, hemangioma are present in 10% cases as incidental findings but may also present with compressive symptoms in aggressive lesion with bony expansion, destruction and soft tissue component.[5]

A lumbosacral transitional vertebra is an anomalous vertebra with intermediate morphological features of lumbar and sacral vertebra. The prevalence of lumbosacral transitional vertebra is common with prevalence ranging from 5-30%.[1,3] This study showed transitional lumbosacral vertebra in 3.8% patient. The association of lumbosacral transitional vertebra with low back pain termed as Bertolotti syndrome is debated in the literature with many supporting the association.[11,12,15,16] Lumbosacral transitional vertebra also has its clinical importance in communicating the spinal level of pathologies thus avoiding wrong level surgeries and also better correlation of pathology with symptoms.[9]

There were certain limitations to our study. The study was a retrospective record based study analyzing patients with low back pain undergoing lumbosacral MRI which thus is not representative of the general population.

The common non-degenerative morphological associations of low back pain were traumatic lesions, infection and neoplastic lesions. Lumbosacral transitional

vertebra was fairly common association with low back pain. Spinal meningeal cysts and hemangioma represented incidental finding rather than a cause of low back pain.

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