Discogenic Low Backache – A clinical and MRI correlative study

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Introduction:

Low back pain can be caused by a variety of conditions including musculoskeletal, osteoarticular and neurogenic disorders. The lifetime prevalence of low back ache is approximately 80% of the population. Over the past 30yrs, the rate of disability claims related ti low lackache has increased by 14 times the rate of population growth1.

Many different imaging studies are commonly performed in patients with low backache. Despite the use of multiple imaging studies, the precise cause of back pain remains obscure in some patients. Not all abnormal findings on imaging of symptomatic patients correlate with the course of pain. Magnetic resonance imaging (MRI) provides clinicians with a non-invasive mechanism for viewing lumbar anatomy in great detail. The objective of this study is to assess the role of MRI in discogenic low back ache.

Aim:

To assess the association between patients' report of symptoms and anatomic impairment visible on lumbar magnetic resonance imaging.

Material and methods:

In our study we selected 150 patients who attended our orthopaedic clinic. Out of them we studied 132 patients with low back ache, who fulfilled our criteria:

Inclusion criteria:

- all patients with low back ache

Exclusion criteria:

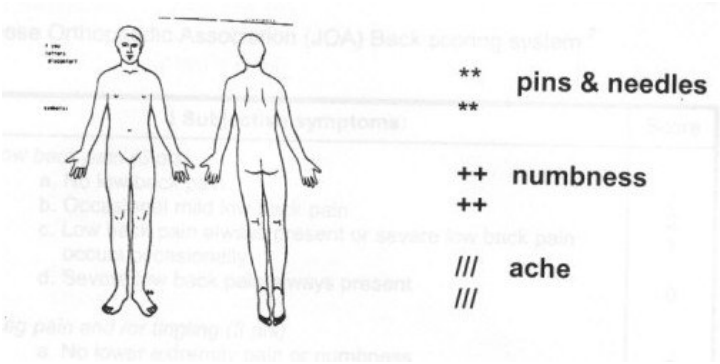
- Patients with history of or evidence of connective tissue disease and autoimmune disease.
- Patients with spinal deformities like scoliosis
- Low back ache clinically suggestive of pseudo spinal pain
- Patients with known contraindication for MRI
- Patients who were not co-operative during imaging study (claustrophobia).

The results of this study were analyzed **using 'p' value.**

All patients underwent a diagnostic work up which included:

- Detailed history
- Pain assessement using visual analogue pain scale system (VAS)
- Assessment of the level of physical activity
- Body Mass Index

- Pain drawing system



- Low back ache based on the segmental distribution of pain is classified as :

1	Primary LBP	Pain confined to the posterior trunk and / or buttocks.
2	Posterior thigh referral	Pain in one or both posterior or lateral thigh.
3	L1- L3 distribution	Pain in inguinal region, and /or proximal anterior thigh.
4	L4 - L5 distribution	Pain in mid and distal anterior thigh, anterior, medial or lateral leg.
5	S1- S2 distribution	Pain in posterior leg, lateral border of foot, and / or plantar surface of the foot.
6	Bilateral distribution	Any bilateral combinations of 3-5
7	Atypical	Pain patterns not fitting descriptions above, non - dermatome patterns.

- Clinical features were evaluated by direct questioning and examination using Japanese Orthopaedic Association (JOA) scoring system

- MRI imaging (1.5 – 17GB tesla Siemens MRI magnetom unit and axial sections were taken in T1 & T2 weighed images. MRI was done for all patients scanning from D12 to Sacrum.
  Nomenclature used to describe the disc herniations were:

  Normal – no disc extension beyond the interspace

  Bulge – circumferential symmetric extension of the disc beyond the interspace.

  Protrusion – focal or asymmetric extension of the disc beyond the vertebral border, with the origin broader than any other dimension of the protrusion.

  Extrusion – more pronounced extension of the disc beyond the vertebral border, with the base narrower than the diameter of the extruding material itself. Penetration of the disc material through the outer annulus.

  Sequestration – a free disc.

- MRI scoring system by Boden et al was used:

MRI FINDINGS	SCORE
HERNIATED NUCLEUS PULPOSUS	
- Normal	0
- Bulge	1
- Protrusion (NP contained in annulus fibrosis but with contour abnormality)	2
- Extrusion (NP extending through annulus but still contiguous with the lost nucleus)	3
- Free fragment (migration of herniated fragment away from the disc space)	4
STENOSIS OF CANAL (non discogenic loss of epidural fat with compression of neural tissue within the canal)	
- Normal	0
- Mild (flattening of ventral thecal sac)	1
- Moderate (triangulation of spinal canal with loss of the posterior epidural fat pad)	2
- Severe (compression of the canal with loss of epidural fat in all planes)	3
DISC BULGE	
- Normal	0
- Asymmetric	1
- Diffuse (non focal, non osseous material extending beyond the disc space in circumferential manner)	2
DISC DEGENERATION	
- normal	0
- mild (slight dehydration of the disc on T2 weighed image)	1
- moderate (disc dehydration and mild loss of disc height)	2
- severe (total disc dehydration with nearly complete loss of disc height)	3
SPINAL NERVE DEFROMATION IN THE LATERAL RECESS OR INTERVERTEBRAL FORAMEN	
- Absent (no visible disc material contacting or deforming nerve)	0
- Minimal (contact with disc material deforming nerve but displacement less than 2 mm)	1
- Moderate (contact with disc material displacing 2 or more mm. the nerve is still visible and not obscured by disc material)	2
- Severe (contact with disc material compressing the nerve)	3

Results:

Out of 132 patients, 72 were men and 60 were women. The mean age of the patient was 42yrs ranging from 16 to 76 yrs.

There was no significant association among age, gender and degree of symptoms, chronicity with image findings.

Pain pattern drawing system:

On correlating pain pattern drawing system with mri findings, majority of patients with disc bulge lesion had pain drawing pattern confined to low back area only. The pain pattern segmental distribution system, show that primary low back pain as the commonest distribution (47%). Out of 61 patients with 1* low back ache, 48 had disc bulge; 12 had disc protrusion; one had a normal study.

Disc level distribution:

Out of 128 patients with disc lesion, 70 patients had one level lesion; two level lesions were seen in 37 patients and multilevel lesion in 20 patients. There was no correlation between ages, chronicity of symptom with number of level of disc lesion.

Comparison of motor weakness with MRI findings:

Motor presentation (muscle weakness) of each patient was correlated with MRI disc levels.

Motor weakness was analyzed separately for each disc types.

For Disc extrusion (p<0.001 SS):
In all 27 patients, there is a correlation between motor and disc level.

For Disc protrusion (p<0.05 SS):
Only 26 patients out of 38 patients showed correlation.

For Disc bulge (p>0.05 NS):
Only 6 patients out of 61 shows correalation.

Comparison of sensory defect with MRI results:

Sensory defect of each patient was correlated with the MRI findings. It was analyzed separately for each disc types.

For disc extrusion (p<0.01 SS):
Almost 25 out of 27 patients showed correlation.

For disc protrusion (p>0.05 ns):
Only 21 out of 38 patient shows correlation between the clinical presentation of sensory level and disc level seen in MRI.

For disc bulge (p>0.05 ns):

Only 16 out of 61 patients showed correlation.

Analysis of nerve root compression seen in MRI:

In the analysis of nerve root compression, the most common level was L4 – L5 level, followed by L5-S1 level. MRI findings of nerve root compression were compared with clinical presentation (segmental distribution of pain). It was analysed separately for each disc type.

For disc extrusion (p<0.05):

In patient with extrusion type the clinical correlation with MRI findings of nerve root compression was significant (p value < 0.05 SS).

For disc protrusion (p< 0.05 SS):

Only 15 out of 38 patients (39%) correlated with clinical findings.

For disc bulge (p > 0.05):

When correlating these with clinical findings, only 24 out of 61 patients (38%) with disc bulge correlated.

Discussion:

Pain felt in LBP may originate from the vertebrae, ligaments, fascias, muscles, facet joints or inter vertebral discs. Intra disc pathology was assumed to play a major role in non specific LBP syndromes and chronic LBP. Even nucleus pulpous tissue known to have marked inflammatory properties 4. LBP caused by multiple factors, the clinical correlation with the MRI finding is highly confusing and very difficult.

The results of this study indicate that, gender, age, BMI, duration of symptoms have no significant association with the image findings.

Patients can be reliably classified on the basis of segmental pain distributions. There appears to be significant association when compared with MRI results ($p<0.01$). interestingly strong association was seen with large disc displacement (ie extrusion) and with severe nerve compression.

In this study, we used a rating scale for quantifying nerve compression and to determine whether a specific threshold existed whereby the magnitude and location of nerve compression could be related to patient's clinical features. The findings imply that minimal or moderate compression on nerve roots by disc bulge and protrusion does not correlate with clinical pattern ($p>0.05$ ns). In disc extrusion (27) cases clinical presentation strongly correlate with nerve compression findings in MRI ($p<0.05$ ss).

Similar results were seen when motor and sensory features were compared with MRI presentation. Lumbar disc extrusion or severe nerve compression visible on lumbar MRI strongly predicts ipsilateral distal lower extremity pain5.

Maureen c, Jense, Michael T Modic performed MRI examination on 98 asymptomatic subjects6. This study revealed that 36% of subjects had normal disc at all levels, 52% had bulge at atleast one level and 12% had a protrusion. They concluded that many people without back pain have disc bulge or protrusion but not extrusion.

Likewise, Stadnik, Lee and Coen7 – studied about the prevalence of annular tear and disk herination on MRI in 36 volunteers without LBP or sciatica. The results revealed that annular tears and focal disk protrusion on MRI were frequently found in asymptomatic population. Extrusion disk herination, displacement of nerve root and interruption of annular ligamentous complex were unusual findings in an asymptomatic population and can be closely related to patients with LBP or sciatica.

The cause of LBP and leg pain in condition with mild to moderate nerve root compression remains obscure.

One reason for the low predictive value of such image findings may be their positional dependence8. Dominik, Marius, Marco from university hospital, Zurich, Switzerland, studied about postional MR imaging of the lumbar spine to demonstrate nerve root compression which were not visible at conventional MR imaging (supine position). This study included

a group of 30 patients with disk abnormalities but without compression of neural structures. Then disk and nerve root was related to body position. Nerve root contact without deviation was present in 34 of 152 instances in the supine position, 62 instances in the seated flexion position, 45 instances in the seated extension position.

With the present MRI, subjects are imaged in the supine position reduces the symptoms of LBP or radiculopathy, perhaps because of a decreased in degree of nerve compression 9. With open configuration MR system, imaging can be performed in the seated position.

Schonstrom et al demonstrated experimentally in cadaver specimens, the reduction of the area of the dural sac between a flexed and an extended spine, both anatomically and on MR imaging10.

Another explanation for the variation in symptoms between people with similar MRI findings may relate to the presence of various chemical mediators such as substance P11. These may cause irritation of a nerve root but not generate a detectable signal intensity changes on MRI.

Conclusion:

- lumbar disc extrusion or severe nerve compression visible on MRI strongly correlate with clinical findings.
- Mild to moderate nerve compression, disc degeneration or bulge visible on MRI were not associated with clinical features in majority of cases.

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