

Points

- Stress MRI with an axial loading device applies stress, which simulates the effect of gravity
- Stress MRI often uncovers significant canal stenosis, when the neutral images show mild disease, especially with facet OA.
- Stress MRI is also useful in the post-operative situation, in spondylolysis and with synovial cysts.

Stress MRI of the Lumbar Spine

Many symptomatic patients with degenerative disease of the lumbo-sacral spine have normal or minimally abnormal findings on standard supine MRI studies. It is known from dynamic myelography that thecal sac and nerve compression is often unmasked only in the erect position.

Stress MRI with an axial loading device (Fig. 1A) simulates the effect of gravity and induces changes in the spinal canal dimensions and thecal sac areas. The effect of stress can be assessed visually (qualitatively), especially using the MR myelogram images as well as quantitatively by measuring the thecal sac areas on the axial images at various disc levels, before and after the application of stress.

The patient is first scanned routinely without application of stress. The stress device is then primed (Fig. 1B). This axial loading device applies a compressive force that is equal to half the body weight of the patient, distributed equally on both sides. This is left

on for 5 minutes after which T2 sagittal, axial and MR myelogram scans were obtained.

Stress MRI shows significant findings, mainly in patients with degenerative soft tissue canal stenosis, especially those with single level stenosis, (Fig. 2) often reproducing the symptoms as well. In patients with canal stenosis, studies have shown that a reduction in thecal sac area to less than 75 sq mm or a reduction in area by more than 15% from the rest study, are findings suggesting significant disease. Thecal sac areas between 75 and 100 sq mm. suggest relative stenosis that needs to be correlated with the clinical presentation.

It is also helpful in post-operative patients (Fig. 3), in patients with synovial cysts (Fig. 4) and in those with spondylolysis (Fig. 5). It is not as helpful in patients with purely disc herniations. MRI myelogram images are extremely useful in depicting the changes in thecal sac and nerve compression.



Fig. 1A

Fig. 1B

Fig. 1 (A, B): The stress device (A) is as shown and has counters for precisely adjusting the pressure applied. A shoulder holster is used as showing (B) in the supine, psoas-relaxed position without hip or knee flexion, the feet pressed firmly against the device. Different sizes of holsters are available to fit different patients

The online version is up at <http://www.jankharia.com/innerspaces/current.htm>



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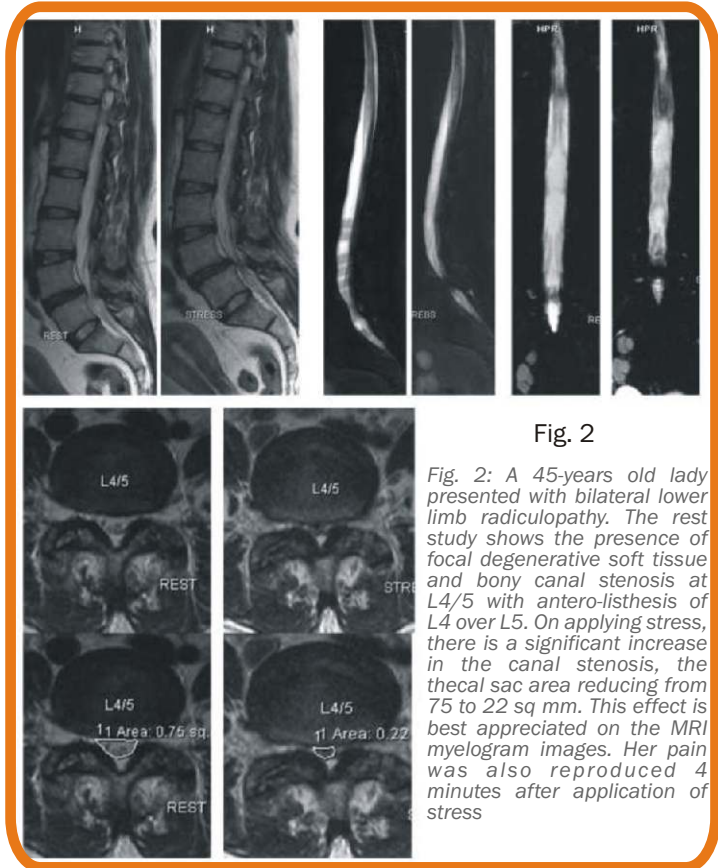


Fig. 2

Fig. 2: A 45-years old lady presented with bilateral lower limb radiculopathy. The rest study shows the presence of focal degenerative soft tissue and bony canal stenosis at L4/5 with antero-listhesis of L4 over L5. On applying stress, there is a significant increase in the canal stenosis, the thecal sac area reducing from 75 to 22 sq mm. This effect is best appreciated on the MRI myelogram images. Her pain was also reproduced 4 minutes after application of stress

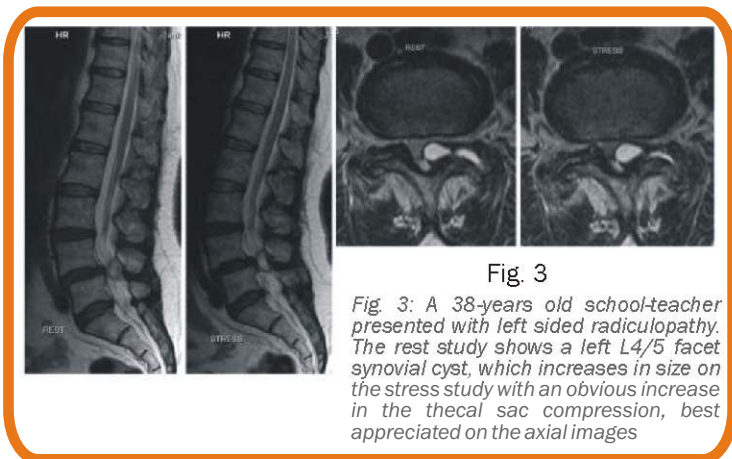


Fig. 3

Fig. 3: A 38-years old school-teacher presented with left sided radiculopathy. The rest study shows a left L4/5 facet synovial cyst, which increases in size on the stress study with an obvious increase in the thecal sac compression, best appreciated on the axial images

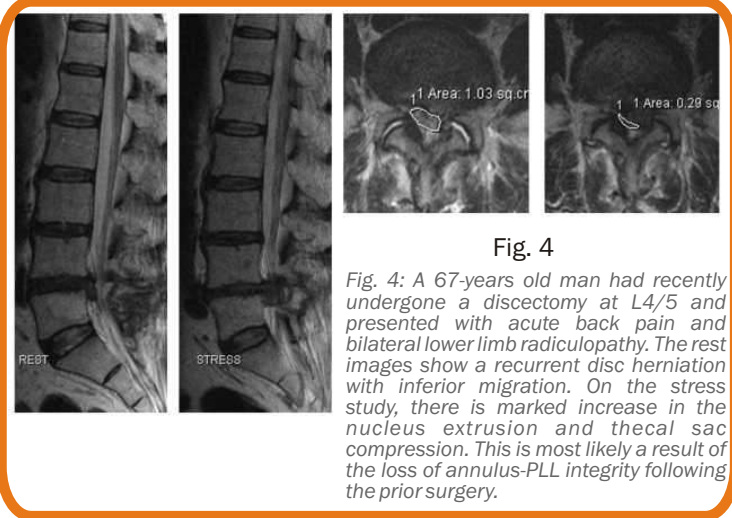


Fig. 4

Fig. 4: A 67-years old man had recently undergone a discectomy at L4/5 and presented with acute back pain and bilateral lower limb radiculopathy. The rest images show a recurrent disc herniation with inferior migration. On the stress study, there is marked increase in the nucleus extrusion and thecal sac compression. This is most likely a result of the loss of annulus-PLL integrity following the prior surgery.



Fig. 5

Fig. 5: A 52-years old lady with spondylolysis and listhesis shows an increase in the listhesis on the stress study.

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