Spine imaging: should we take this lying down?

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useful for directing and monitoring lactulose therapy but, perhaps more important, it may be useful for evaluating other treatments, such as TIPS and new medical therapies for HE.

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References

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The purpose of this editorial is to advocate further experimental work such as that which Muhle et al describe in this issue of the *American Journal of Neuroradiology* (page 1763).

For spine imaging, patients are placed in a supine position, often with supports or cushions to enhance their comfort. This position, which minimizes the patient’s discomfort, may diminish any visible effect of spinal cord or spinal nerves. Weight-bearing, flexion, extension, or lateral bending change anatomic relationships, especially in the neural foramina and central spinal canal. Therefore, the application of some force to the spine during imaging may improve the detection of significant pathologic changes.

Kinematic and functional imaging studies of the spine have been reported in the neuroradiologic and orthopedic literature. Prolonged standing diminishes the size of the neural foramina and central spinal canal because disks lose water and height whenever the load on the spine is increased. Axial loading of the spine decreases the disk height measured on MR images, and axial compression of the spine causes bulging of the intervertebral disk and narrowing of the diameters of the neural foramen and central canal. In imaging studies, flexion or extension significantly narrows the neural foramina in relation to the neutral position. Flexion, extension, or axial rotation forces applied to the spine narrow the neural foramina at spinal levels with degenerating disks enough to cause mild compression of spinal nerve roots. One CT investigation in adult volunteers with disk degeneration has shown that a bulging disk, and to a greater extent a herniated disk, increases the amount of rotation that will occur at that level when a rotatory force is applied (Johansen JG, Nork M, Fleming G, “Torsional Instability of the Lumbar Spine,” poster exhibit at the annual meeting of the American Society of Neuroradiology, Philadelphia, May 1998). The effect of weight-bearing, load, and disk degeneration on spinal nerves needs more study to clarify the relationship between disk degeneration and back pain.

While disk degeneration is widely considered to be a major cause of back pain, the precise relationship between disk degeneration and back pain has been poorly characterized. Degeneration in the intervertebral disk is blamed for many cases of lower back and sciatic pain, and yet intervertebral disk degeneration is found in up to 50% of asymptomatic persons at MR imaging. The effect of disk degeneration on spinal stiffness may explain some discrepancies in the clinical significance of degenerating disks. Disk degeneration reduces the stiffness of the disk so that any force applied to the spine produces a greater motion and therefore greater stress in the other connective tissues, such as the anterior longitudinal ligament, posterior longitudinal ligament, and capsule of the facet joint. The motion produced by a specific force depends on the type of degenerative change in the intervertebral disk. Therefore, kinematic spine imaging technique may help us to understand the motions of the spine and to distinguish clinically significant disease.

The spine, which appears immobile in our static images, is far from a rigid structure. The neural foramina and central spinal canal, which appear immobile in images, undergo constant change as a result of the loads they sustain during daily activities. Thus, the function of the spine can be better understood if it is imaged in various load conditions. Muhle et al have devised a method of imaging the cervical spine in flexion and extension and have attempted to quantify the resulting anatomic changes. While their classification system may not receive immediate acceptance, their techniques may stimulate new kinematic imaging studies of the spine.

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