Intervertebral Disc

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Advanced imaging methods such as computed tomography (CT) and magnetic resonance imaging (MRI) provide excellent structural images of the spine including the intervertebral disc. However, structural imaging of the spine does not reliably identify the source of pain in patients with intervertebral disc degeneration. The ongoing development of functional imaging techniques is helping physicians detect the source of pain and other symptoms. The findings still need to be correlated with the patients history and physical examination findings.

New and potentially useful functional imaging strategies used to assess the spine and the intervertebral disc include dynamic computed tomography, dynamic magnetic resonance imaging, functional magnetic resonance imaging, diffusion imaging, and magnetic resonance spectroscopy. Magnetic resonance spectroscopy (MRS) is used to evaluate the biochemical makeup of tissues, kind of an MRI biopsy.

Before the development of noninvasive imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI), techniques that employed the use of contrast material included myelography, epidural venography, and epidurography. These procedures were performed in carefully selected patients with back pain to help determine whether they were a good good candidate for surgery. As imaging techniques have improved the search is on for other sources of back and extremity pain.

CT and MRI currently provides excellent detail of disc herniations and their relationship to the spinal cord and spinal nerves. Routine studies performed without special protocols can not confirm how things are working or where the source of pain is. The demonstration of disc degeneration with these studies does not tell whether it is the cause of back pain.

Several MR-based techniques now available provide functional information that may be useful in patients with back pain. With MR imaging the unique movement of water molecules in tissues can be tracked and measured. Because tissue structure determines the direction and magnitude of water diffusion, diffusion imaging may be used to examine the structure of spinal tissues. Diffusion-weighted imaging and its more sophisticated form, diffusion tensor imaging (DTI), can be applied to the study of the spinal cord or intervertebral disc.

Another new MRI technique, magnetic resonance spectroscopy (MRS), can be used to evaluate the concentration and relationship of chemicals within tissues. For example, lactic acid and other chemicals can be measured in the spinal cord or the intervertebral disc without using an invasive method. It can be performed without placing the patient at risk. Magnetic resonance imaging can be performed after the injection of intravenous contrast medium to help assess the dynamics of the intervertebral disc. Measuring the rate at which the injected contrast moves into the disc provides a measure of glycosaminoglycans, which is an important chemical building block of a discs structure.

Neurography is a high resolution MR technique which can be used to evaluate functional changes in spinal nerve roots adjacent to

disc abnormalities.

Dynamic CT or MR imaging of the spine can be used to assess the motions of the spine and it segments. These techniques are used to evaluate the stability of the intervertebral disc and the spine.