

Upright weight-bearing cervical flexion/extension dynamic magnetic resonance imaging: Case report and review of the literature

John W. Gilbert*, Greg R. Wheeler, Richard A. Lingreen, Robert K. Johnson, Steven J. Scheiner, Richard D. Gibbs

Spine and Brain Neurosurgical Center, 1721 Nicholasville Road, Lexington, KY 40503, United States

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Abstract

Conventional recumbent magnetic resonance imaging (MRI) of the cervical spine may underestimate disease because the imaging is performed in a non-dynamic, non-weight bearing position. The cervical myelogram may provide additional information but requires an invasive procedure and a post-myelogram computed tomography (CT) scan. We present a patient with cervical symptomatology imaged in an upright weight-bearing sitting position in the flexion, neutral, and extension positions. Measurements of the anterior to posterior midsagittal plane were obtained at several disc space levels. The T₂ sagittal images are presented and compared. This case clearly shows a reduction in the anterior–posterior distance in the midsagittal plane progressively from flexion to neutral to extension with the extension position showing the greatest reduction in cervical central canal diameter. Images show a decrease in anterior and posterior subarachnoid space in the extension position. Upright weight bearing cervical flexion/extension dynamic magnetic resonance imaging provides an innovative noninvasive technique to see changes in midsagittal cervical spinal canal diameter and may provide for imaging of the dynamic nature of spinal cord compression. © 2006 Elsevier Ireland Ltd. All rights reserved.

Keywords: Magnetic resonance imaging; Cervical vertebrae; Spinal canal; Subarachnoid space

1. Introduction

The cervical spine is frequently imaged by plane X-ray, computed tomography (CT) or magnetic resonance imaging (MRI), or myelography with post-myelogram CT. Each modality has advantages for the practicing neuroscience physician.

Plane X-rays are inexpensive, but they will not diagnose ruptured disc or show pathology of the spinal cord. Furthermore, when the patient shows limited flexion and extension motion on physical exam, the flexion/extension plane X-ray radiographs are of limited utility. Cross-sectional imaging may be warranted in these high-risk patients [1].

CT is probably the mainstay in the workup of the cervical trauma patient. CT scanning, however, has a far lower sensi-

tivity for soft disc protrusion than MRI. The introduction of X-ray contrast by lumbar puncture for cervical myelogram with post-myelogram CT significantly increases the sensitivity in detecting cervical stenosis or cervical disc protrusion; however, the technique is not only invasive but also lacks sensitivity in detecting intrinsic pathology of the spinal cord.

Cervical magnetic resonance imaging has become a standard diagnostic procedure in the outpatient workup of a variety of neuroscience pathologies. Most neurosurgical disorders now rarely require invasive myelography and post-myelogram CT. Indeed, the presence of intramedullary signal changes on T₁ and T₂ weighted sequences is a useful predictor of surgical prognosis [2]. Most MRI systems currently in use, however, normally image the cervical spine in the neutral position (i.e., not flexed or extended) and in a non-weight bearing-type of position (i.e., recumbent). Lumbar disc pressure is lowest in the recumbent position, slightly higher in a standing position, and highest in a sitting position [3].

* Corresponding author. Tel.: +1 859 252 6500; fax: +1 859 252 3073.

E-mail address: spncmd@yahoo.com (J.W. Gilbert).

URL: <http://www.sbncmd.com>.

