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Abstract The advent of a multi-detector row helical CT has made it possible to attain images over a broader area with good spatial resolution. We assessed whether postmyelographic CT scans obtained using this system provided more information than conventional imaging techniques. Postmyelographic CT scans were preoperatively obtained in 46 patients using a multi-detector row helical CT system. Reconstructed images in the sagittal and coronal planes in all patients and curved reformation images along the dural sac in 37 patients were compared with myelograms and conventional postmyelographic CT scans. In 34 patients comparison was also made with MR images. The multi-detector row CT images demonstrated deformities of the dural sac more clearly than the other modalities in 39 of the 46 patients. They also provided the best visualization of nerve root abnormalities in 24 of the 46 patients and clearly revealed the presence of spurs in all 22 patients with spinal canal stenosis. Postmyelographic CT scans made using a multi-detector row helical CT system provide more information on the dural sac, nerve sleeves, and their contents than other imaging techniques.

Keywords Computed tomography · Techniques · Myelography · Spine

Application of multi-detector row helical scanning to postmyelographic CT

Introduction

Postmyelographic CT or CT myelography is widely accepted as a valuable adjunct to conventional myelography. It is performed after myelography to obtain axial images of regions of interest. They not only provide detailed information on the size and contour of the spinal canal, the posterior elements, and adjacent soft tissue, but also reveal fine abnormalities within the dural sac [1, 2, 3, 4, 5, 6, 7]. In many institutions, postmyelographic CT is still considered to be an essential preoperative modality for the assessment of spinal pathological processes, even though the importance of MR imaging has been increasing in this area.

With the recent advent of multi-detector row helical CT systems, data over a broader area can now be acquired with better longitudinal spatial resolution and a shorter scanning time than with single detector-row scanners. Such data can be effectively reconstructed into images of required planes.

The purpose of this study was to test the hypothesis that postmyelographic CT images obtained using this system would provide more information than conventional imaging techniques.

Materials and methods

Our patient group consisted of 46 consecutive patients referred for preoperative postmyelographic CT study. The patients included 33 men and 13 women, ranging in age from 15 to 75 years. A total of 37 patients were examined for lumbar lesions, including disk herniation in 21 patients and spinal canal stenosis in 16 patients. Eight patients had cervical lesions consisting of spinal canal stenosis in 6 patients and ossification of the posterior longitudinal ligament in 2 patients. One patient had an intradural arachnoid cyst in the thoracic spine. In all patients, the diagnosis was established during subsequent surgery.
After obtaining written informed consent regarding possible increased radiation dose due to adding a helical scan from each patient, the postmyelographic CT study was performed 2–3 h after a myelography using the standard dose (10–15 ml) of nonionic contrast material (240 mg I/ml; Isovist, Schering, Berlin, Germany) for each region. Using a multi-detector row helical CT scanner (Aquilion, Toshiba, Tokyo, Japan) equipped with a four-channel detector system, we first obtained conventional postmyelographic CT scans parallel to the intervertebral disks. Immediately afterwards, we performed a helical scan of the regions of interest using the following parameters: 120 kVp; 300 mA; 32-cm field of view; 512×512 matrix; 2-mm collimation; helical pitch of 3; 0.5-s rotation time; and coverage of 25 cm in 21 s. From the data thus obtained, we reconstructed images in the sagittal and coronal planes using a 2-mm collimation and no intersection gap. In addition, curved reformation images along the dural sac in the coronal plane were created in 37 patients. The section thickness of the reformatted images was 0.6 mm, equal to the size of one pixel of the reconstructed images (32 cm/512). These postprocessing procedures were performed using software incorporated in the scanner.

In all 46 patients, three trained neuroradiologists who were unaware of the final diagnosis independently assessed the CT images obtained using the four-channel helical CT system and compared them with myelograms and the conventional postmyelographic CT scans. Comparisons with MR images were also performed in 34 patients. The MR images included sagittal T1- and T2-weighted and axial T2- or T2*-weighted images obtained using a 3-mm collimation at 1.5 T. The assessment focused on which technique provided the clearest visualization of dural sac deformities, nerve sleeves deformities in 21 patients with lumbar disk herniation, abnormalities (shifts and/or deformity) of the nerve roots, bony spurs, and ossified ligaments. In cases of disagreement, a final judgment was reached by consensus of the three readers.

In addition to the clinical examinations, the radiation dose was also measured using an acrylic phantom (150 mm in length, 320 mm in diameter). The same parameters employed in the clinical examinations were used in the phantom study. Using the same scanner, the exposure dose at the center of the phantom was measured using an ionization chamber. Measurements were performed during a four-channel helical scan as well as a conventional one-channel scan.

Fig. 1a–d  L5–S1 disk herniation in a 36-year-old man.

a  T2-weighted MR image (TR 4000 ms/TE 160 ms/2 excitations) shows a large herniated disk. b Conventional myelogram shows dural sac indentation on the left side at the L5–S1 level (arrow). c Conventional postmyelographic CT scan shows protrusion of the disk prominent on the left side. d Curved coronal reformation image clearly shows a deformity of the dural sac as well as the resulting obliteration of the adjacent nerve sleeve on the left side.