Digital Rotational Radiography and 3D Reconstruction Myelography: Preliminary Experience

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Purpose
The purpose of this study was to assess applicability, technical performance, and diagnostic efficacy of digital rotational radiography in myelography including image postprocessing by volume rendering and multiplanar reformation in spinal lesions affecting nerve roots or spinal cord.

Materials & Methods
Fifteen patients (7 women, 8 men), with spinal degenerative, neoplastic, and congenital lesions affecting nerve roots or the spinal cord underwent myelography using a C1/C2 puncture (12 patients) or a lumbar puncture (3 patients) and intrathecal injection of a nonionic contrast agent (Iosvist 300, Schering). The mean age was 51 years (15–60 years). In all patients myelography was required because of the mismatching between clinical features and findings obtained with other imaging modalities. Examinations were performed on a digital angiography system (Neurostar Plus, Siemens). In addition, to standard myelography a 200° rotation of the tube-camera unit within 8 or 14 sec was performed using an acquisition matrix of 1024 x 1024. Acquired data were transferred to a graphic workstation (Siemens 3DVirtuoso). Postprocessing techniques included real time 3D volume rendering (RT3D), multiplanar reformatting (MPR), maximum intensity projection (MIP), and shaded surface display (SSD). The maximal matrix of reconstructions using isotropic voxels was 512 x 512 with a spatial resolution of 0.6 mm. Mean reconstruction time was 15 min (10–20 min). The acquired 3D data were compared with findings obtained by conventional myelography and other imaging modalities (CT, postmyelo-CT).

Results
In all patients compared to the standard myelogram, 3D reconstruction increased a) the detection of anatomical details such as the thecal sac and the dural root sleeves without superimposing structures in different planes and b) the depiction of extradural and intradural spinal lesions. Disk herniation was found in 13 patients, with cervical location in 12 and lumbar location in 1 patient. Spinal stenosis and narrowing of neuroforamina were associated with disk herniation in 4 of 13 patients and in 5 of 13 patients, respectively. For extradural spinal lesions, MPR and SSD allowed a better differentiation between bony and soft tissue, difficult to achieve in conventional myelography. Two patients with intradural lesions undergoing myelography were included in our study. 3D reconstruction was able to provide a better delineation of location and extent of a thoracic glioma compared to conventional myelography. In another patient, presenting with an epidermoid cyst, a communication with the subarachnoidal space as well as a retethering of the cord after previous surgery, could be reliably excluded.

Conclusion
Digital rotational myelography with 3D reconstruction is a valuable, time effective diagnostic tool in the preoperative evaluation of patients with intra- and extradural spinal lesions offering additional information to the standard myelographic procedure. As diagnostic performance proved to be equivalent it may replace postmyelo-CT, thus increasing diagnostic effectiveness and decreasing patient radiation exposure.

References