Celebrating 35 Years of the AJNR: January 1984 edition

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January 1984 edition

Cerebral NMR Imaging: Early Results with a 0.12 T Resistive System

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Over a 6-month period, 157 patients, 89 of whom had central nervous system tumors, were examined on a prototype 0.12 T resistive nuclear magnetic resonance (NMR) imaging unit. All of the patients had computed tomography (CT), which was used as a standard to which the NMR findings were compared. Studies were done primarily by saturation-recovery technique with short repetition times. The signal intensity with saturation-recovery technique did not allow differentiation among most tumor types. Location, extent, and morphology helped to some extent in attempts at differentiation. In the multiplanar mode, NMR compared favorably to CT with regard to lesion detection. Limited early experience suggests that NMR also may detect some lesions when the CT is negative and may detect additional lesions when one or more are present. The NMR examination was well tolerated by selected patients.

In November 1982, a General Electric (GE) 0.12 T (5.1 MHz), developmental, resistive nuclear magnetic resonance (NMR) proton imaging system was installed at the Hospital of the University of Pennsylvania. This allowed the study of 157 patients for disease processes involving the brain, face, or upper cervical region over the next 6 months. During that time, software improvements were made, resulting in ability to obtain more sections in less time and simultaneous sectioning of a given volume of interest in coronal and sagittal planes, in addition to the transverse plane. We present the initial experience with this unit.

Subjects and Methods

Between November 1982 and May 1983, 11 volunteers and 157 selected patients were examined by NMR in order to evaluate the brain in most cases and in several instances the face, neck, and upper cervical spinal cord. Thirty-one patients were age 20 or younger. The

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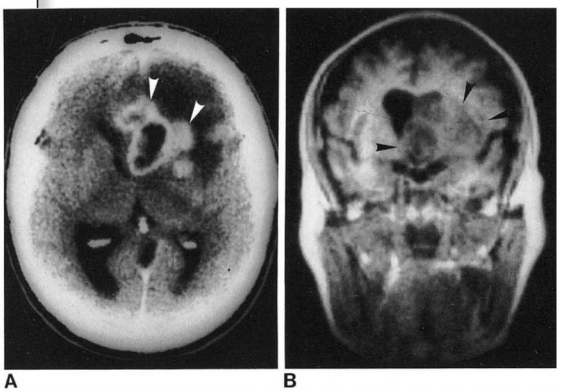

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Magnetic Resonance Imaging of the Cervical Spine: Technical and Clinical Observations

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Seventy-two patients were examined to determine the clinical potential for magnetic resonance imaging (MRI) of the spine. MRI using different pulse sequences was compared with plain radiography, high-resolution computed tomography, and myelography. There were 35 normal patients; pathologic conditions studied included canal stenosis, herniated disk, metastatic tumor, neurofibroma, trauma, Chiari malformation, syringomyelia, arteriovenous malformation, and rheumatoid arthritis. MRI provided sharply defined anatomic delineation and tissue characterization. It was diagnostic in syringomyelia and Chiari malformation and was useful in the evaluation of trauma and spinal canal block from any cause. MRI was sensitive to degenerative disk disease and infection. The spin-echo technique, with three pulse sequence variations, seems very promising. A short echo time (TE) produces the best signal-to-noise ratio and spatial resolution. Lengthening the TE enhances differentiation of various tissues by their signal intensity, while the combined increase of TE and recovery time (TR) produces selective enhancement of the cerebrospinal fluid signal intensity.

Early clinical experience with magnetic resonance imaging (MRI) has demonstrated its potential in the evaluation of the spine and foramen magnum [1–5]. With appropriate pulse-sequence technique, the spinal cord, brainstem, cerebrospinal fluid (CSF), and extradural structures such as the intervertebral disk have been depicted without the use of intrathecal contrast or ionizing radiation. We evaluated different magnetic resonance pulse sequences and compared the images with myelograms, CT scans, and plain radiographs of the cervical spine.

Subjects and Methods

Seventy-two patients formed the subject group for this study. Thirty-seven patients were studied for known or suspected disease of the cervical spine and foramen magnum. Thirty-five patients were studied as normal controls.

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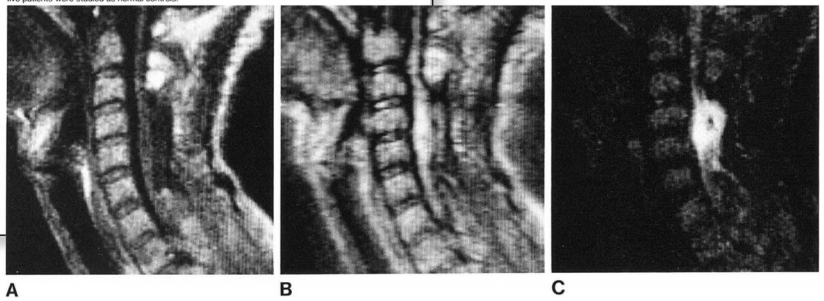

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