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MR of the Spine in Guillain-Barré Syndrome

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Summary: MR examination of the spine after injection of gadopentetate dimeglumine showed enhancement of the cauda equina in a case of Guillain-Barré syndrome. These MR observations may help confirm the diagnosis of Guillain-Barré syndrome.

Index terms: Cauda equina; Spine, magnetic resonance; Spine, abnormalities and anomalies; Spinal cord; Pediatric neuroradiology

Guillain-Barré syndrome is a recognized entity diagnosed mainly by clinical findings as well as cerebrospinal fluid studies and electrodiagnostic criteria (1). A humoral-immunologic basis is strongly considered a cause for this syndrome (2). Pathologically, the disease is characterized by scattered inflammatory lesions throughout the peripheral nervous system (3). Supportive measures are still the mainstay of therapy, but recently plasmapheresis and infusion of immunoglobulin have gained an important role (4). We report a case of Guillain-Barré syndrome with spinal abnormalities demonstrated by magnetic resonance (MR).

Case Report

A 3-year-old girl was admitted to the hospital with a 4-day history of weakness in her lower extremities. Three weeks before the onset of weakness, the child had a febrile illness that was believed to be secondary to bacterial otitis media. Neurologic examination on admission showed a mild facial diplegia, generalized hypotonia, quadriparesis, and generalized areflexia without evidence of sensory loss. Three lumbar punctures were performed before and on the day of admission. All cerebrospinal fluid examinations showed elevated protein concentrations and no cells. Other laboratory findings were normal. Clinical and laboratory findings were more consistent with the diagnosis of Guillain-Barré syndrome. The child was admitted to the intensive care unit, where she received 400 mg/kg per day of intravenous γ -globulin for 5 consecutive days. MR imaging of the thoracic and lumbar spine showed enhancement of the anterior nerve roots in the lumbar region of the cauda equina (Fig 1). With increasing appetite, decreasing anal-

gesic needs, and increasing movement in the lower extremities, the patient was discharged. She received active physical therapy to maintain muscle tone.

Discussion

MR imaging, unlike other spinal imaging techniques, is capable of showing enhancement of the nerve roots after contrast administration. Normally the dorsal root ganglia and nerve roots enhance after they exit the thecal sac, because of the absence of the blood-nerve barrier at these levels (5). Abnormal enhancement of the lumbar roots and cauda equina has been reported in patients with acquired immunodeficiency syndrome-related polyradiculopathy (6) and in post-operative arachnoiditis (7). In general, enhancement of nervous tissue after gadolinium injection indicates a lack of integrity of the blood-brain or blood-nerve barrier and is commonly caused by neoplastic or inflammatory processes.

Although several reports have suggested a process of breakdown or a defect in the blood-nerve barrier in Guillain-Barré syndrome (2), they describe the disease as being confined to the peripheral nervous system. In cases of Miller-Fisher syndrome, a clinical variant of Guillain-Barré syndrome characterized by ataxia, areflexia, and ophthalmoplegia, brain stem lesions have been described with cranial MR imaging (8). Given the pathologic changes of breakdown of the blood-nerve barrier in Guillain-Barré syndrome and the previous reports of enhancement at similar sites of pathologic change, it is reasonable to anticipate contrast enhancement in the nerve roots with Guillain-Barré syndrome. The enhancement pattern is unique in demonstrating enhancement in a more proximal location than would be anticipated from the known pathology of Guillain-Barré syndrome. The proximal site of enhancement is easier to detect radiologically, because the spinal cord and roots are bathed in cerebrospinal fluid and are often the target of imaging in patients presenting with motor and/

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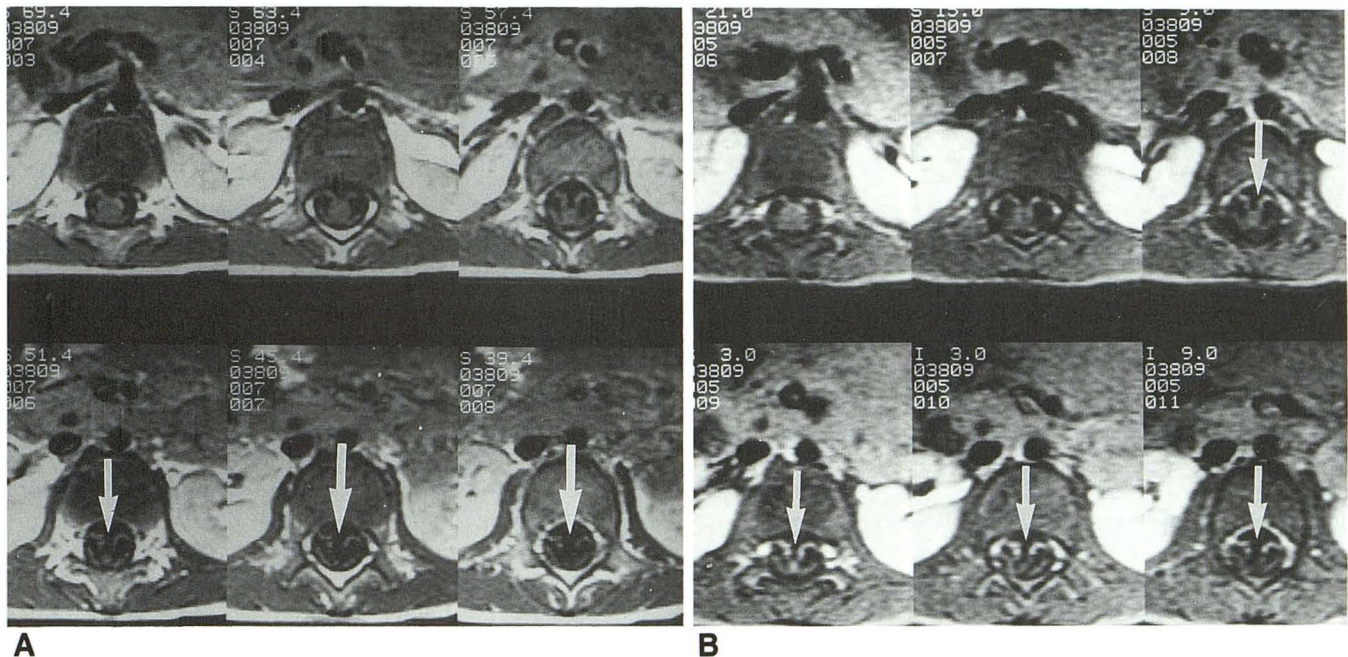


Fig. 1. A, Axial T1-weighted (500/12/2 [repetition time/echo time/excitations]) images of the lumbar region after gadolinium injection. B, Axial-enhanced T1-weighted images (700/12/2) using fat suppression at the same levels. The enhancement of the anterior nerve roots (arrows) is seen better after fat suppression.

or sensory symptoms referable to the spine. On the other hand, the peripheral nerves are not routinely imaged.

The widespread use of gadopentetate dimeglumine and new MR system enhancements such as larger matrix size (512×512), acquisition of thin sections, and phased-array coils provide higher resolution MR images with good signal-to-noise ratios and may further improve our ability to detect nerve root lesions. The addition of fat suppression to gadolinium-enhanced sequences can highlight enhancing tissues by expanding the dynamic gray scale of the image (9). This technique was very useful in confirming the abnormal enhancement in our case. By expanding the dynamic gray scale we mean that the portion of the image with the highest signal intensity, typically fat, is assigned as the brightest part of the image. Subsequently, all lower signal intensities are rank ordered beneath fat. Once fat is removed from the image, the next highest signal, which may have been of intermediate brightness—usually the enhanced lesion—will now be assigned as the brightest signal. In this manner, with the removal of fat, the dynamic gray scale is expanded over the remaining contrast range.

In summary, although enhancement of the spinal cord and proximal nerve roots is a nonspecific finding seen in neoplastic and inflammatory processes, it may be an important imaging fea-

ture of Guillain-Barré syndrome, leading to earlier diagnosis and treatment of this disorder. Serial imaging may be useful in monitoring response to therapy and assessing new treatment regimens, and may also yield a better understanding of the disease process.

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