MEDICAL NECESSITY GUIDELINES

Subject: Magnetic Resonance Neurography
Number: 0316

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INSTRUCTIONS FOR USE
This Medical Necessity Guideline outlines the factors CareAllies considers in determining medical necessity for this indication. Please note, the terms of a participant's particular benefit plan document or summary plan description (SPD) may differ significantly from the standard upon which this Medical Necessity Guideline is based. For example, a participant's benefit plan document or SPD may contain a specific exclusion related to the topic addressed. In the event of a conflict, a participant's benefit plan document or SPD always supercedes the information in this Medical Necessity Guideline. In the absence of a controlling federal or state coverage mandate, benefits are ultimately determined by the terms of the applicable benefit plan document or SPD. Coverage determinations in each specific instance require consideration of 1) the terms of the applicable group benefit plan document or SPD in effect on the date of service; 2) any applicable laws/regulations, and; 3) the specific facts of the particular situation. Medical Necessity Guidelines are not recommendations for treatment and should never be used as treatment guidelines.

Magnetic resonance neurography is considered experimental, investigational or unproven and thus not medically necessary.

General Background

The diagnosis and management of disorders involving peripheral nerves has traditionally relied upon information derived from a patient's clinical history, neurological examination, and electrodiagnostic studies, including nerve conduction studies and electromyography (EMG). Electrodiagnostic studies are highly sensitive in detecting nerve conduction abnormalities but may lack specificity and may not show the anatomical detail necessary for precise localization of pathology and treatment planning.

Magnetic resonance neurography (MRN) is a magnetic resonance image (MRI) modified with special software and hardware upgrades. MRN is performed using special pulse sequences, in combination with custom-built phased-array imaging surface coils, on a standard 1.5 Tesla (T) MRI system. Phased-array coils acquire image data simultaneously from multiple receive-only surface coils that have been implemented by several manufacturers of MRI equipment. Image data from each coil in the array are combined into a composite image, resulting in improved signal-to-noise ratio that enhances the visibility of peripheral nerves and increases the conspicuity of peripheral nerve lesions. Standard T1-weighted pulse sequence images demonstrate anatomical detail, while heavily T2-weighted pulse sequences and short tau inversion recovery (STIR) fat-suppression sequences enhance the conspicuity of peripheral nerve lesions. Compared with MRI techniques that use standard coils, MRN using phased-array coils permits acquisition of anatomically detailed images with fewer excitations, i.e., faster acquisition, smaller field-of-view, higher resolution matrices, up to 512 × 512, to improve in-plane spatial resolution, and thinner sections that result in images capable of showing the fascicular organization of normal peripheral nerves (Britz et al., 1995; Kuntz et al., 1996; Hayes, 2002).

It has been proposed that MRN is capable of generating high-resolution longitudinal and cross-sectional images of major peripheral nerves and associated intraneural and extraneural lesions. Electrodiagnostic tests are physiological tests, while MRN is an anatomical study. In 1996, researchers Filler and colleagues reported that direct nerve imaging can demonstrate nerve continuity, distinguish intraneural from extraneural masses, and localize nerve compressions prior to surgical exploration. The use of MRN to confirm and localize nerve compressions depends partly on its ability to reliably identify nerves located adjacent to: lymph nodes; adipose collections; blood vessels; ligaments; and other structures of similar shape, size, and location. Filler and colleagues state this is possible because of the ability to obtain longitudinal images, which show fascicular pattern, in addition to cross-sectional images. Also, the researchers propose that MRN can add clinically useful diagnostic information in many situations in which physical examinations, electrodiagnostic tests, and existing image techniques are inconclusive (Filler, et al., 1996).

Literature Review

Filler et al. (2005) prospectively evaluated 239 consecutive patients with sciatica in whom standard diagnosis and treatment had failed to effect improvement. Patients without adequate lumbar spine imaging data obtained within the past 12 months underwent updated spinal radiography and MRI. When a diagnosis could not be established by inspecting routine spine imaging, patients were referred for lumbar and pelvic soft-tissue MRI and MRN evaluation. Patients in whom physical examination findings and medical history were consistent with piriformis syndrome and in whom MRN did not rule out piriformis syndrome were considered to have probable piriformis syndrome and were referred for open MRI–guided piriformis muscle injection. The authors stated that when piriformis muscle asymmetry alone is used as a criterion to identify individuals with piriformis syndrome, MRN sensitivity was 64% and specificity was 93% in distinguishing patients with piriformis syndrome from those without, who had similar symptoms. With a new diagnosis identified, treatment (i.e., Marcaine injection into the piriformis muscle and piriformis surgery) was then pursued. Authors stated this study demonstrated an indication for MRN in patients with sciatica in whom an obvious spinal origin for this condition is absent. The authors noted that MRN and imaging-guided injection techniques can establish the correct diagnosis and guide management for both pelvic sciatic entrapment and nonstandard lumbar entrapment. The sensitivity of MRN (64%) compared with other MR imaging techniques or other diagnostic imaging modalities is not known, as MRN was not compared with other MR imaging techniques or other diagnostic imaging modalities.

Lewis et al. (2006) conducted a retrospective medical record review of 14 patients with unexplained sciatic distribution pain. In each patient, prior results of MRI of the lumbosacral spine were normal or demonstrated findings that were determined by the clinician to be incompatible with the patient's history and examination. Three other patients with sciatica and normal results on lumbar MRI who were diagnosed as having nonsciatic-related pelvic pathologic features on MRN were used as control subjects. Results demonstrated focal signal abnormalities within the sciatic nerve in the buttock in almost all patients with unexplained sciatica. The authors stated that results of this study suggest MRN may have the ability to aid in the diagnosis of sciatic nerve entrapment by the piriformis muscle; however, the small sample size and case series from a retrospective medical record review design limits the ability to draw conclusions.

Raphael et al. (2005) performed MRN of the brachial plexus in ten volunteer subjects. Multiple software programs were explored for enhanced display and manipulation of the composite MRIs. Raphael and colleagues developed a frontal slab composite MRN approach. The authors concluded that image-processed, three-dimensional, volume-rendered MRN scans, which allow visualization of the entire brachial plexus within a single composite image, have educational value in illustrating the complexity and individual variation of the plexus.

A prospective clinical trial of 30 carpal tunnel syndrome patients (plus eight controls) was conducted to evaluate the clinical, electrophysiological and MRN findings before and three months after surgery (Cudlip, et al., 2002). The authors stated that MRN in patients with carpal tunnel syndrome demonstrated proximal swelling and high signal change in the nerve, together with increased flattening ratios and loss of nerve signal in the distal carpal tunnel. Sagittal images were very effective in precisely demonstrating the site and severity of nerve compression. After surgery, division of the flexor retinaculum could be demonstrated in all cases. The authors concluded that MRN is an effective means of confirming both compression of the median nerve and its successful surgical decompression in patients with carpal tunnel syndrome. They noted that this modality may prove useful in the assessment of unconfirmed or complex cases of carpal tunnel syndrome, both before and after surgery.

Case reports on 15 patients with neuropathic leg pain referable to the lumbosacral plexus or sciatic nerve undergoing high-resolution MRN were published (Moore, et al., 2001). Thirteen of the patients also underwent routine MRI of the lumbar segments of the spinal cord before undergoing MRN. None of the routine MRI studies of the lumbar segments of the spinal cord established the cause of the reported symptoms. Researchers report MRN showed a causal abnormality accounting for the clinical findings in all 15 cases (i.e., detecting fibrous entrapment, muscular entrapment, vascular compression, posttraumatic injury, ischemic neuropathy, neoplastic infiltration, granulomatous infiltration, neural sheath tumor, postradiation scar tissue, and hypertrophic neuropathy).

In a comparative study, Britz et al. (1995) evaluated MRI findings in 43 wrists in 32 patients with carpal tunnel syndrome (study group) and five wrists in people who had no symptoms (control group). The authors stated that abnormalities of the median nerve, as revealed by MRN, were found in 43 of 43 (100%) wrists in the study group and in none of five (0%) wrists in the control group. Authors concluded that MRN of the median nerve is a sensitive diagnostic modality that can demonstrate signal and configurational abnormalities of the median nerve in patients diagnosed with carpal tunnel syndrome. Next, Britz et al. (1996) evaluated 31 elbows in 27 patients with ulnar nerve entrapment (study group) and ten controls. The authors stated that MRN demonstrated increased signal of the ulnar nerve in 30 (97%) elbows of the 31 and enlargement of the ulnar nerve in 23 (74%). No MRN abnormalities were found in the control population. The authors concluded that MRN was both sensitive and specific in diagnosing ulnar nerve entrapment at the elbow, as defined by clinical, electrodiagnostic and operative findings. Neither study provided results for sensitivity, specificity, positive predictive value and negative predictive value.

Summary
No professional society has published positions or guidelines addressing this technology. A search of the published, peer-reviewed scientific literature identified review articles, letters, and studies in the form of very small population case series and case studies. While these very limited data suggest that magnetic resonance neurography (MRN) may be a promising technology, they are not sufficient to permit any conclusions regarding the efficacy of MRN in the diagnosis or management of peripheral nerve disorders. Well-designed, large population, randomized, controlled studies are needed to supply sufficient evidence of diagnostic utility and to establish the appropriate clinical applications of MRN when used either as a single diagnostic tool or in conjunction with other examinations, including other MR imaging techniques and magnet strengths. The role of MRN in the diagnosis and management of peripheral nerve disorders is unknown at this time.

Coding/Billing Information

Note: This list of codes may not be all-inclusive.

Experimental/Investigational/Unproven/Not medically necessary:

CPT* Codes	Description
	No specific codes

HCPCS Codes	Description
	No specific codes

ICD-9-CM Diagnosis Codes	Description
	All codes

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