Peripheral Neuropathies: A Practical Approach for the Hospitalist

Rachel Thompson, MD, FHM
Michael D. Weiss, MD

Department of Medicine, Harborview Medical Center, University of Washington, Seattle, Washington.
Department of Neurology, University of Washington Medical Center, Seattle, Washington.

Peripheral neuropathies are a common problem with a myriad of potential etiologies that may be encountered acutely. Early diagnosis of certain neuropathies can lead to life-saving therapy. This article reviews the literature on diagnostic approaches to peripheral neuropathies and suggests a structured framework of pattern recognition and systematic evaluation to aid the hospitalist in efficient evaluation of urgent cases. *Journal of Hospital Medicine* 2009;4:371–374. © 2009 Society of Hospital Medicine.

Early diagnosis of peripheral neuropathies can lead to life-saving or limb-saving intervention. While infrequently a cause for concern in the hospital setting, peripheral neuropathies are common—occurring in up to 10% of the general population.1 The hospitalist needs to expeditiously identify acute and life-threatening or limb-threatening causes among an immense set of differentials. Fortunately, with an informed and careful approach, most neuropathies in need of urgent intervention can be readily identified. A thorough history and examination, with the addition of electrodiagnostic testing, comprise the mainstays of this process. Inpatient neurology consultation should be sought for any rapidly progressing or acute onset neuropathy. The aim of this review is to equip the general hospitalist with a solid framework for efficiently evaluating peripheral neuropathies in urgent cases.

### Literature Review

#### Search Strategy

A PubMed search was conducted using the title word “peripheral,” the medical subject heading major topic “peripheral nervous system diseases/diagnosis,” and “algorithm or diagnosis, differential or diagnostic techniques, neurological or neurologic examination or evaluation.” The search was limited to English language review articles published between January 2002 and November 2007. Articles were included in this review if they provided an overview of an approach to the diagnosis of peripheral neuropathies. References listed in these articles were cross-checked and additional articles meeting these criteria were included. Articles specific to subtypes of neuropathies or diagnostic tools were excluded.

#### Search Results

No single guideline or algorithm has been widely endorsed for the approach to diagnosing peripheral neuropathies. Several are suggested in the literature, but none are directed at the hospitalist. In general, acute and multifocal neuropathies are characterized as neurologic emergencies requiring immediate evaluation.2,3

Several articles underscore the importance of pattern recognition in diagnosing peripheral neuropathies.2,4,5 Many articles present “essential questions” in evaluating peripheral neuropathy; some suggest an ordered approach.1,3,5–11

The nature of these questions and recommended order of inquiry varies among authors (Table 1). Three essentials common to all articles include: 1) noting the onset of symptoms; 2) determining the distribution of nerve involvement; and 3) identifying the pathology as axonal, demyelinating, or mixed. All articles underscore the importance of the physical examination in determining and confirming distribution and nerve type. A thorough examination evaluating for systemic signs of etiologic possibilities is strongly recommended. Electrodiagnostic testing provides confirmation of the distribution of nerve involvement and further characterizes a neuropathy as demyelinating, axonal, or mixed.

#### A General Approach for the Hospitalist

Pattern recognition and employing the “essentials” outlined above are key tools in the hospitalist’s evaluation of peripheral neuropathy. Pattern recognition relies on a familiarity with the more common acute and severe neuropathies. For circumstances in which the diagnosis is not immediately recognizable, a systematic approach expedites evaluation. Figure 1 presents an algorithm for evaluating peripheral neuropathies in the acutely ill patient.

### Pattern Recognition

In general, most acute or subacute and rapidly progressive neuropathies merit urgent neurology consultation. Patterns to be aware of in the acutely ill patient include Guillain-Barré syndrome, vasculitis, ischemia, toxins, medication exposures, paraneoplastic syndromes, acute intermittent porphyria, diphtheria, and critical illness neuropathy. Any neuropathy presenting with associated respiratory symptoms or signs, such as shortness of breath, rapid shallow breathing, or hypoxia or hypercarbia, should also trigger urgent neurology consultation. As timely diagnosis of concerning entities relies heavily on pattern recognition, the typical presentation of more common etiologies and clues to their diagnosis are reviewed in Table 2.

For example, neuropathy from acute intermittent porphyria classically presents with pain in the back and limbs and progressive limb weakness (often more pronounced in the upper extremities). Respiratory failure may follow. A key to this history is that symptoms frequently follow within days
of the colicky abdominal pain and encephalopathy of an attack. Additionally, attacks typically follow a precipitating event or drug exposure. These patients do not have the skin changes seen in other forms of porphyria. Treatment of this condition requires recognition and removal of any offending drug, correction of associated metabolic abnormalities, and the administration of hematin.12

Another, though rare, diagnosis that relies on pattern recognition is Bruns-Garland syndrome (also known as proximal diabetic neuropathy). This condition is usually self-limited, yet patients can be referred for unnecessary spinal surgery due to the severity of its symptoms. The clinical triad of severe thigh pain, absent knee jerk, and weakness in the lumbar vertebrae L3-L4 distribution in a patient with diabetes should raise concern for this syndrome. The contralateral lower extremity can become involved in the following weeks. This syndrome is typified by a combination of injuries to the nerve root, the lumbar plexus, and the peripheral nerve. Electrodiagnostic testing confirms the syndrome, thus avoiding an unwarranted surgery.12

A Systematic Evaluation
When the etiology is not immediately evident, the “essential questions” identified in the review above are useful, and can be simplified for the hospitalist. First, understand the onset and timing of symptoms. Second, localize the symptoms to and within the peripheral nervous system (including classifying the distribution of nerve involvement). For acute, rapidly progressing or multifocal neuropathies urgent inpatient electrodiagnostic testing and neurology consultation should be obtained. Further testing, including laboratory testing, should be directed by these first steps.

Step 1
Delineating onset, timing and progression is of tremendous utility in establishing the diagnosis. Abrupt onset is typical of trauma, compression, thermal injury, and ischemia (due to vasculitis or other circulatory compromise). Guillain-Barré syndrome, porphyria, critical illness neuropathy, and diptheria can also present acutely with profound weakness.
Neuropathies developing suddenly or over days to weeks merit urgent inpatient evaluation. Metabolic, paraneoplastic, and toxic causes tend to present with progressive symptoms over weeks to months. Chronic, insidious onset is most characteristic of hereditary neuropathies and some metabolic diseases such as diabetes mellitus. Evaluation of chronic neuropathies can be deferred to the outpatient setting.

Nonneuropathy causes of acute generalized weakness to consider in the differential diagnosis include: 1) muscle disorders such as periodic paralyses, metabolic defects, and myopathies (including acute viral and Lyme disease); 2) disorders of the neuromuscular junction such as myasthenia gravis, Eaton-Lambert syndrome, organophosphate poisoning, and botulism; 3) central nervous system disorders such as brainstem ischemia, global ischemia, or multiple sclerosis; and 4) electrolyte disturbances such as hyperkalemia or hypercalcemia.14

The hospitalist should be able to classify the distribution as a mononeuropathy (involving a single nerve), a...
In summary, symptoms and signs of multifocal or proximal nerve involvement, acute onset, or rapid progression demand immediate diagnostic attention. Pattern recognition and a systematic approach expedite the diagnostic process, focusing necessary testing and decreasing overall cost. Focused steps in a systematic approach include: (1) delineating timing and onset of symptoms; (2) localizing and classifying the neuropathy; (3) obtaining electrodagnostic testing and neurology consultation; and (4) further testing as directed by the preceding steps. Early diagnosis of acute peripheral neuropathies can lead to life-saving or limb-saving therapy.

Address for correspondence and reprint requests:
Rachel Thompson, MD, Assistant Professor, General Internal Medicine, Harborview Medical Center, University of Washington Box 359780, 325 9th Ave, Seattle, WA 98104; Telephone: 206 744 2854; Fax: 206 744 6303; E-mail: rethomps@u.washington.edu
Received 20 June 2007; revision received 18 April 2008; accepted 26 May 2008.

References

Step 3
Inpatient electrodiagnostic testing and neurology consultation should be ordered for any neuropathy with rapid onset, progression or severe symptoms or any neuropathy following one of the patterns described above. Electrodiagnostic testing characterizes the pathologic cause of the neuropathy as axonal, demyelinating, or mixed. It also assesses severity, chronicity, location, and symmetry of the neuropathy. It is imperative to have localized the neuropathy by history and examination prior to electrodiagnostic evaluation to ensure that the involved nerves are tested.

Step 4
Focused, further testing may be ordered more efficiently subsequent to the above data collection. Directed laboratory examination should be performed when indicated rather than cast as an initial broad diagnostic net. Ultrasound, magnetic resonance imaging (MRI), computed tomography–positron emission tomography (CT-PET), and nerve biopsy are diagnostic modalities available to the clinician. In general, nerve biopsy should be reserved for suspected vasculitis, sarcoidosis, lymphoma, leprosy, or amyloidosis.

Polyneuropathy (symmetric involvement of multiple nerves), or a mononeuropathy multiplex (asymmetric involvement of multiple nerves). Multifocal and proximal symmetric neuropathies commonly merit urgent evaluation.

The most devastating polyneuropathy is Guillan-Barré syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis. Vasculitis is another potentially treatable syndrome, which can be fatal but is often reversible with early plasmapheresis.