A Case of Guillain-Barré Syndrome in a Primary Care Setting
Sherly Sebastian, DNP, RN, NP-C

ABSTRACT
Guillain-Barré Syndrome (GBS) is an immune-mediated peripheral neuropathy characterized by rapidly progressive symmetrical ascending weakness and sensory loss. The disease can progress rapidly and be fatal if diagnosis and treatment interventions are delayed. In most patients, the neuropathic symptoms are preceded by an antecedent infection. The patient may present with initial symptoms of upper respiratory tract infection or gastroenteritis. This article presents a case report of GBS, followed by a detailed discussion of the pathophysiology, diagnostic studies, differential diagnosis, types, prognosis, and management of patients with this condition.

Keywords: ascending weakness, immune response, peripheral neuropathy, respiratory failure, sensory loss

© 2012 American College of Nurse Practitioners

Guillain-Barré Syndrome (GBS) is an immune-mediated peripheral neuropathy characterized by rapidly progressive symmetrical ascending weakness and sensory loss. The disease is named after the physicians Guillain, Barré, and Strohl, who described the clinical presentation in 2 French soldiers during the First World War about 100 years ago.¹ According to the National Institute of Neurological Disorders and Stroke figures,² the annual incidence rate for GBS is about 1-2 per population of 100,000. In the acute phase of GBS, approximately 3% of patients may die from acute complications and up to 20% have residual, permanent, severe disability with ambulation deficits or require ventilator assistance up to 12 months later.³

The annual financial burden from GBS is estimated at $1.7 billion, including $0.2 billion (14%) in direct medical costs and $1.5 billion (86%) in indirect costs from lost productivity or premature death.⁴ Even though incidence is low, the economic cost of GBS is substantial as a result of high mortality and morbidity.

CASE REPORT
This patient is a 36-year-old Hispanic woman who presented to the outpatient clinic with complaints of numbness, tingling, and weakness in her legs. The patient was initially seen in the clinic 3 weeks ago with upper respiratory tract infection and was treated with a course of amoxicillin. Her upper respiratory symptoms improved, but a week later she noticed numbness and tingling in her feet, progressively ascending to her legs and thighs. She was evaluated at the local hospital, and her diagnostic work-up included blood cultures and spinal tap. The emergency room (ER) physician consulted the neurologist, but the patient left ER against medical advice.

The numbness became progressively worse, and she started having bilateral lower extremity weakness and gait issues. She fell 2 days ago, and her family forced her to seek medical help. Her past medical history was unremarkable except for the upper respiratory infection (URI) 3 weeks ago. The patient's review of systems was negative for shortness of breath, fever, chills, cough, and swallowing difficulties. Her vital signs were temperature 37°C, pulse 112/minute, blood pressure 108/62, respiration 28/minute, weight 162 lbs, height 5'2".

On neurological examination, the patient was alert and oriented X 3, with intact speech, comprehension, and memory; pupils equal round reactive to light. Dysmetria was noted for finger-to-nose and rapid alternating movements...
Table 1. Guillain-Barré Syndrome Variants

<table>
<thead>
<tr>
<th>Acute Inflammatory Demyelinating Polyneuropathy (AIDP)</th>
<th>Most prevalent in United States and Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immune response at myelin sheath and schwann cells</td>
<td>Cranial and sensory nerves more affected than motor nerves</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acute Motor Axonal Neuropathy (AMAN)</th>
<th>More prevalent in pediatric group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immune response is against motor axon membranes</td>
<td>Motor involvement without sensory findings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acute Motor and Sensor Axonal Neuropathy (AMSAN)</th>
<th>More rapid progression and paralysis with sensory and motor deficits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axonal degeneration of ventral and dorsal nerve roots</td>
<td>Prolonged recovery with painful sensory component</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Miller-Fisher Syndrome (MFS)</th>
<th>Rare subtype, classic findings of areflexia, ataxia, and ophthalmoplegia</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Acute Panautonomic Neuropathy</th>
<th>Very rare subtype affecting both sympathetic and parasympathetic systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recovery is slow and incomplete, with high mortality and morbidity</td>
</tr>
</tbody>
</table>

bilaterally. Her cranial nerve exam was intact. Her motor strength in triceps, biceps, and supinator were 5/5; deltoids and pronator were 4/5; wrist extensors and flexors were 4/5 bilaterally; hip flexors, quadriceps, and hamstrings were 4/5 bilaterally; dorsiflexors and plantar flexors were 3/5 bilaterally. Her sensation was intact on upper extremities but diminished to touch and pin prick on lower extremities and abdomen. Her gait was ataxic, deep tendon reflex (DTR) 1+ and symmetrical on deltoid, biceps, brachioradialis and triceps; DTR was absent on knees and ankles.

The patient's laboratory studies did not reveal any infectious process. Her cerebrospinal fluid (CSF) studies from the hospital revealed elevated protein count of 200 mg/dL, with normal cell count, which confirmed the diagnosis of GBS. The disease can progress rapidly and can be potentially fatal if treatment interventions are delayed. The patient was transported expeditiously to the nearest hospital for admission to the intensive care unit.

DIAGNOSIS

GBS is a heterogeneous syndrome with several variant forms affecting the peripheral nervous system as a result of an immune-mediated disturbance involving the peripheral myelin sheath. The commonly recognized variants are summarized in Table 1.

The patient in the case study provides many of the classic characteristics of GBS, such as progressive development of ascending symmetrical paresthesia, pain, bilateral motor weakness, areflexia, and ataxia. Accurate diagnosis requires clues from the clinical history, such as onset, severity, and rate of progression of the symptoms over hours to days. A careful neurological examination including the motor strength, cranial nerves, and reflexes is essential. Clinical manifestations are summarized in Table 2.

Antecedent Infections

The history of a prodromal respiratory infection should raise suspicion for GBS, because in majority of GBS patients, neuropathic symptoms are preceded by a URI or enteric infection. History of cough, fever, sore throat, diarrhea, or any other types of infections 2–3 weeks before the onset of weakness should alert the clinician to suspect GBS. Campylobacter jejuni, a bacteria commonly associated with gastroenteritis, have been identified as the most frequent antecedent pathogen of GBS.6,7
Vaccinations

The evolution of GBS after vaccination has been studied extensively, as concerns about vaccine-induced GBS were initially raised after the 1976–77 influenza vaccination period. The landmark study done by Lasky et al. reported marginally increased risk of GBS after influenza vaccination during the first 6 weeks of immunization. Subsequently, researchers investigated the relationship between GBS and the influenza vaccinations and reported that low relative risks were not statistically significant. Extensive research is reported after the H1N1 mass vaccination in 2009 and found no evidence of an increased risk of GBS after the seasonal influenza vaccine or the H1N1 vaccination.

Diagnostic Studies

CSF analysis with evidence of high protein and normal cell count support the diagnosis of GBS. The value of lumbar puncture is limited in the early phase of the disease. CSF may remain normal in up to 50% of patients early in the disease, but elevated protein will be present in more than 90% of the patients by the time they reach clinical nadir. However, increased CSF cell count steers the clinician to consider other diagnoses and investigate possibility of infectious process, such as leptomeningeal malignancy, West Nile virus infection, HIV, or Lyme disease. If the CSF results are normal, repeat testing is not done typically.

Electrodiagnostic testing is done frequently to identify the acute motor weakness caused by a peripheral neuropathy. The test is helpful in confirming the diagnosis and differentiating the variants of GBS. However, early in the disease process, the testing may be normal. The features of demyelination in GBS include slow conduction, temporal dispersion, and prolonged or absent F-responses. Abnormal median and ulnar sensory potentials with spared sural potentials are seen in the initial stages of GBS. The nerve conduction study is considered a useful confirmatory test, which typically demonstrates the finding of reduced muscle action potentials in clinically weak muscles. Magnetic resonance imaging (MRI) is typically performed to rule out infiltrative or structural causes of weakness. Moreover, MRI may reveal enhancement of the affected nerve roots supportive of GBS diagnosis. The limitations of these tests in the early phase of the disease, combined with the urgency for early treatment, require clinicians to make the diagnosis on clinical grounds and promptly refer to hospital/specialist care.

Differential Diagnosis

Ascending symmetrical weakness progressing over hours to days is the cardinal symptom of GBS. If the symptoms are prolonged over 8 weeks, other diagnoses should be considered. If the weakness is asymmetric, clinicians should consider a spinal or intracranial diagnosis instead of GBS. If there is weakness with intact reflexes, another diagnosis should be investigated. The predominant features of Miller Fisher Syndrome, such as ophthalmoplegia, areflexia, and ataxia, often mistakenly suggest brain stem infarction. A wide range of neurological disorders may mimic the symptoms of GBS; most common differentials are listed in Table 3.

Table 3. Differential Diagnoses

<table>
<thead>
<tr>
<th>Chronic Inflammatory Demyelinating Polyneuropathy (CIDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms similar to GBS but progressing over a longer period (&gt; 8 weeks)</td>
</tr>
<tr>
<td>Myasthenia Gravis (MG)</td>
</tr>
<tr>
<td>Weakness in the voluntary muscles controlling the eyelids, face, swallowing</td>
</tr>
<tr>
<td>Weakness and fatigue pronounced with effort and relieved with rest</td>
</tr>
<tr>
<td>Diplopia and/or ptosis, normal sensation and reflexes</td>
</tr>
<tr>
<td>Anterior Horn Cell Abnormalities</td>
</tr>
<tr>
<td>Some similar features, but weakness pattern is different</td>
</tr>
<tr>
<td>Clinical signs of infection, including high cell count in cerebrospinal fluid</td>
</tr>
<tr>
<td>Spinal Cord Disorders</td>
</tr>
<tr>
<td>Radiculopathy, unilateral motor and sensory deficits</td>
</tr>
<tr>
<td>Hyperreflexia, sharp sensory levels</td>
</tr>
<tr>
<td>Pain aggravated with activities</td>
</tr>
<tr>
<td>Intracranial Abnormalities</td>
</tr>
<tr>
<td>Change in level of consciousness, severe headaches</td>
</tr>
<tr>
<td>Unilateral motor and sensory deficits</td>
</tr>
</tbody>
</table>

PATHOPHYSIOLOGY

The pathogenesis of GBS has been widely studied but is still not completely understood. The proposed mechanism involves an antecedent infection leading to an autoimmune response reacting with peripheral nerve components (Figure 1). Most of the pathogens gain entry to the body through mucosal or gut epithelium and induce antibody production against specific ganglio-
Figure 1. Guillain-Barré Syndrome Pathogenesis.

Pathogenesis and recovery

Campylobacter jejuni infection

Immune response to LOS

Antigen presenting cell

Cross-reactive antibodies to nerve gangliosides

Plasma cell

Macrophage

Nerve dysfunction

Complement

Conduction dysfunction/block

Clinical prognostic factors

• Age
• Severity at onset
• Diarrhoea

Extent of nerve damage

• Ganglioside distribution in nerves
• Specificity/affinity antibodies
• Complement activation

Disease-modifying factors

Bacterial factors

• LOS biosynthesis cluster
• Ganglioside mimicry of LOS

Host factors

• Genetic polymorphisms
• Immune status

Antigen-presenting cell

T cell

B cell

sides in myelin. The immune response depends on bacterial factors, such as the specificity of lipo-oligosaccharide (LOS), and on host factors, such as genetic polymorphism and immune status. The presence of antibodies leads to activation of T cells and complements, leading to a cascade of inflammation and demyelination. The demyelination decreases the velocity of nerve conduction and slows the impulse transmission along the axons. The extent of nerve damage varies, with more damage seen in the intensely myelinated peripheral nerves, causing motor and sensory weakness.

The self-limiting nature of the disease process should be taken into account, symptoms improve once the autoimmune inflammatory process is terminated, and the Schwann cells reverse the process to rebuild the myelination of the nerves. In severe cases, the inflammatory process can lead to axonal disruption and permanent damage.

**SUPPORTIVE CARE**

Prevention of life-threatening complications remains the cornerstone of supportive care. Progressive demyelination of the phrenic nerve, innervating the diaphragm, may lead to acute respiratory muscle paralysis. Early detection of respiratory failure and anticipation of mechanical ventilation are crucial to avoid emergency intubation and cardiopulmonary arrest. Life-threatening episodes of hemodynamic instability related to autonomic dysfunction may occur in GBS patients (Table 4). They should be admitted to the hospital for close monitoring of respiratory status, hemodynamic instability, and autonomic dysfunction.

**IMMUNOTHERAPY**

Immunotherapy should be initiated as soon as possible with high dose intravenous immunoglobulin (IVIg) or plasma exchange (PE). The mechanism of action of IVIg involves modulating the humoral response by suppressing autoantibody production. IVIg also blocks the binding of receptors on macrophages, suppressing the various inflammatory mediators. The typical dose of IVIg is 0.4g/kg per day for 5 days, started as a lower dose and increased to the maximum dosage based on patient tolerance. The goal of PE is to remove circulating immunoreactive antibodies, complements, and biological response modifiers.

The treatment regimen depends on the disease severity; typically, PE is given 5 times in 2 weeks, for a total exchange of about 5 plasma volumes. The Cochrane Review demonstrated that IVIg and PE are beneficial for accelerating the recovery of GBS, if given during the first 4 weeks of the disease, with most benefit seen if given within the first 2 weeks of symptoms.

**CORTICOSTEROIDS**

The role of steroids in GBS treatment has been widely studied, and researchers concluded that oral corticosteroids were not beneficial in GBS treatment and did not recommend it as the first-line therapy. This finding is in contrast to the standard treatment for other demyelinating diseases for which favorable response is noted with steroid therapy. In one of the studies, the use of intravenous corticosteroids in combination with IVIg demonstrated a short-term improvement in clinical symptoms when compared to IVIg treatment alone. Long-term use of corticosteroids causes numerous side effects and may inhibit macrophage repair process, but short-term treatment did not result in serious side effects.

**PAIN MANAGEMENT**

Neuropathic pain occurs in large number of patients with GBS and often requires recognition and treatment. Nonsteroidal anti-inflammatory drugs (NSAIDs) may be tried initially, but they often do not provide adequate pain relief, as the origin of pain is usually multifactorial. Pain in the acute phase might be nociceptive related to inflammation, whereas later in the course, pain may be related to degeneration of sensory nerve fibers. Early recognition and treatment with gabapentin or carbamazepine are suggested to be effective in treating neuropathic pain. Narcotic analgesics should be used with caution as they precipitate ileus in the setting of autonomic dysfunction.

**PROGNOSIS**

The factors indicating poor prognosis include older age, infection, prolonged hospital stay, need for mechanical ventilation and intensive care, and poor upper extremity

---

**Table 4. Autonomic Dysfunction**

<table>
<thead>
<tr>
<th>Dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tachycardia, bradycardia</td>
</tr>
<tr>
<td>Hypotension, hypertension</td>
</tr>
<tr>
<td>Facial flushing, anhidrosis, hyperhidrosis</td>
</tr>
<tr>
<td>Constipation, paralytic ileus</td>
</tr>
</tbody>
</table>
Table 5. Complications

<table>
<thead>
<tr>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory failure, cardiac arrhythmias</td>
</tr>
<tr>
<td>Swallowing difficulties, aspiration pneumonia</td>
</tr>
<tr>
<td>Deep vein thrombosis, foot drop and joint contractures</td>
</tr>
<tr>
<td>Bladder and bowel dysfunction, paralytic ileus</td>
</tr>
</tbody>
</table>

Weakness. GBS patients may also exhibit pain, fatigability, and functional impairments and may have permanent neurologic impairments, such as muscle wasting, ataxia, foot drop, and dysesthesia. Recovery from GBS varies; most patients recover within 6-12 months, but some may take longer. Thromboembolic complications such as deep vein thrombosis and pulmonary embolus may be prevented with use of fractionated or unfractionated heparin. Early initiation of an individualized program for muscle strengthening and physical therapy is essential to prevent complications (Table 5).

EDUCATION AND COUNSELING

Clearly, GBS management includes applying an improved understanding of the pathophysiology to individual patients and the effect that it has on the vital organs and tissues. Most patients develop secondary complications, and tailoring of supportive care and education should be based on their unique needs. The care of a GBS patient is challenging for the health care team and the caregivers because some symptoms can be devastating. GBS is a life event with a potentially long-lasting influence on physical and psychosocial well-being, transforming a healthy individual into a critically ill and physically helpless person. The acute progression of motor weakness and fatigue makes a profound effect on the patient's quality of life.

Several neuromuscular disease organizations provide resources to assist with community support networks. The Guillain-Barré Syndrome/Chronic Inflammatory Demyelinating Polyneuropathy Foundation (http://www.gbs-cidp.org) is an excellent place to get support, find up-to-date information, and seek opportunities to network.

CONCLUSION

Even though significant advances have been made regarding the immunology and pathophysiology of GBS, it is still continuing as a challenging neurological diagnosis associated with high morbidity and mortality. GBS should be considered in the differential diagnosis for patients presenting to primary care setting with lower extremity numbness with antecedent history of upper respiratory infection or gastroenteritis. The long-term prognosis is dependent on early diagnosis and treatment and knowledge of prognostic factors can substantially improve patient care.

References


Sherly Sebastian, DNP, RN, NP-C, is a nurse practitioner in the neurosurgery department at Baylor College of Medicine in Houston, TX, and can be reached at sherlysebastian@sbcmglobal.net. In compliance with national ethical guidelines, the author reports no relationships with business or industry that would pose a conflict of interest.