Lyme Disease

Description/Etiology
Lyme disease (LD) is an infectious condition caused by the bacterium *Borrelia burgdorferi*. The route of transmission is by the *Ixodes* tick. Humans get LD from *Ixodes* tick bites after being in tick-infested areas (e.g., grassy, wooded areas) or from close contact with an animal (e.g., deer, mice, chipmunks) that carries infected ticks. The longer the tick remains attached to a host, the greater the risk of bacterial transmission.

LD is classified as early localized, early disseminated, or late disease. Persons with early localized disease typically have a primary erythematous rash (i.e., a uniform erythematous rash appearing as a target, or bulls-eye, lesion). This rash is found in about 80% of patients with *B. burgdorferi* infection and appears 3–30 days after the tick bite. Patients with early localized disease can develop flu-like signs and symptoms that include fever, chills, malaise, fatigue, persistent or recurring headache, and myalgia or arthralgia, which often precede the development of the characteristic rash by a few days. Untreated early localized LD progresses to early disseminated and late disease (for details, see Signs and Symptoms/ Clinical Presentation, below). Diagnosis is usually made clinically based on history of possible exposure to ticks, symptoms, and physical signs. Diagnosis can be confirmed by serologic testing.

Treatment of LD is primarily with antibiotics (e.g., doxycycline) and symptom relief is achieved with analgesics, antipyretics, and anti-inflammatory medications. Although antibiotic therapy is curative in most patients, a minority of patients have symptom relapse or have persistent symptoms after antibiotic treatment. Prompt administration of antibiotics after known tick exposure can prevent the development of LD.

Facts and Figures
It is estimated that 329,000 cases of LD occur in the United States each year, and LD can affect individuals of any age. In 2011, 96% of LD cases in the U.S. were reported to occur in Connecticut, Delaware, Maryland, Massachusetts, Maine, Vermont, New Hampshire, Minnesota, New Jersey, New York, Pennsylvania, Rhode Island, and Wisconsin. Connecticut, Delaware, Maine, New Hampshire, and Vermont have the highest annual incidence of LD at > 0.5 cases/1,000 persons and most cases of LD occur in June, July, and August. Incidence of LD in the U.S. is highest in males who are 5–9 years of age and in both males and females who are 60–64 years of age. Countries with the highest incidence in Europe include Austria, Czech Republic, Germany, Slovenia, and northern countries bordering the Baltic Sea.

About 80% of persons infected with *B. burgdorferi* develop erythematousrashes. Among untreated patients, chronic arthritis develops in 10–20% of cases. Up to 5% of untreated individuals may develop chronic neurologic complications (e.g., sensory and motor nerve damage).

Risk Factors
Risk factors include exposure to wooded or grassy areas and to animals carrying ticks. Risk of being bitten by a tick is highest in the spring and fall. Hunters, hikers, and other persons who frequent wooded and/or grassy areas are at increased risk. Risk of developing LD is increased when tick attachment lasts longer than 72 hours. Patients with LD who have
certain genetic factors (e.g., the presence of HLA-DR4 or HLA-DR2 alleles) may be more susceptible to chronic arthritis.

**Signs and Symptoms/Clinical Presentation**

› Early localized LD, which develops 3–30 days after a tick bite: primary erythema migrans, fever, headache, myalgia, arthralgia, fatigue, and general or regional lymphadenopathy

› Early disseminated LD, which develops a few days to 10 months after a tick bite: development of additional erythema migrans lesions, arthralgia (typically in knee joints) stiff neck, photophobia, sensory loss, asymmetric back pain, poor memory, difficulty concentrating, hyporeflexia, nonpainful paresthesia, meningitis, nerve palsies, myocarditis, cardiac conduction blocks, chest discomfort, dyspnea, light-headedness, syncope, Bell’s palsy, encephalitis, peripheral neuropathy, conjunctivitis, anorexia, and nausea

› Late LD, which develops months to years after a tick bite: chronic arthritis (especially in knee joints), severe fatigue, subacute encephalopathy, axonal polyneuropathy, mood and personality changes, sleep disturbances, headaches, paresthesia, and interstitial keratitis

**Assessment**

› **Physical Findings of Particular Interest**
  • In early localized LD, the primary erythema migrans is at least 5 cm in diameter; in early disseminated LD, additional erythema migrans lesions can appear smaller than the primary lesion

› **Laboratory Tests That May Be Ordered**
  • Enzyme-linked immunosorbent assay (ELISA) or indirect fluorescent antibody (IFA) level followed by Western blot assay will identify antibodies, if present
  • Culture of skin lesions and polymerase chain reaction (PCR) test of biopsied skin and blood will identify *B. burgdorferi* DNA, if present
  • Cytologic examination of CSF may be ordered in patients with neurologic signs and symptoms

› **Other Diagnostic Tests/Studies**
  • EKG and echocardiogram are performed if cardiac involvement is suspected
  • CT scan, MRI, and spinal tap are performed if CNS involvement is suspected

**Treatment Goals**

› **Promote Optimum Physiologic Function and Reduce Risk of Disseminated Disease**
  • Monitor vital signs, assess all physiologic systems for LD manifestations, and assess for pain and other discomfort; administer prescribed analgesics for pain and antipyretics for fever
  • Administer prescribed antibiotics (e.g., doxycycline, azithromycin, cefuroxime, or amoxicillin). For patients with LD-related neurologic and/or cardiac manifestations, administer I.V. ceftriaxone, cefotaxime, or penicillin G; anti-inflammatory drugs; or combined antibiotics and anti-inflammatory agents
  • Request referral to physical therapy for patients who are diagnosed with late LD
  • Assess patient/family anxiety level and coping ability; provide emotional support to decrease anxiety and educate about LD pathophysiology, potential complications, treatment risks and benefits, the importance of completing the full course of prescribed antibiotics, and individualized prognosis
  • Request referral to a mental health clinician, if appropriate, for counseling on strategies for coping with having a chronic and potentially disabling condition
  • Request referral, if appropriate, to a social worker for identification of support groups for patients with pain and/or chronic disease

**Food for Thought**

› There are 3 primary strains of *B. burgdorferi*: *B. burgdorferi sensu stricto*, which mainly causes rheumatologic signs and symptoms; *B. garinii*, which mainly causes neurologic signs and symptoms; and *B. afzelii*, which mainly causes cutaneous manifestations

› Erythema migrans can take on multiple forms, and the classic bulls-eye or target-shaped rash occurs in only 20% of LD cases

› LD is underreported. It is speculated that the actual incidence of LD could be as much as 10 times greater than that indicated by CDC data in the U.S.
Red Flags

› Potential complications of LD include aseptic meningitis, encephalitis, chorea, cerebellar ataxia, cranial or peripheral neuropathies, heart block, and congestive heart failure

› Doxycycline should not be given to pregnant or breast-feeding women or to children who are < 8 years of age

What Do I Need to Tell the Patient/Patient’s Family?

› Educate about early and late stages of LD and the importance of adhering to the prescribed antibiotic regimen

› Reassure that LD cannot be transmitted from person to person

› Educate about strategies to prevent LD, including performing tick checks on persons and dogs after outdoor activity; wearing light-colored socks, long-sleeve shirts, long pants tucked in socks, and closed-toe shoes; using pesticides in the yard and spraying insect repellent (e.g., DEET) on clothes before outdoor activity; clearing environmental brush; and avoiding contact with animals that carry ticks, including erecting fences to restrict deer access

› Educate about proper tick-removal technique; ticks should be promptly (e.g., < 48 hours from the time of attachment) and carefully removed with tweezers or another device that is designed for tick removal so that the head does not remain embedded and transmit infection

› Educate that more information and assistance can be obtained from the American Lyme Disease Foundation (ALDF) at www.aldf.com

References


