Lyme Disease

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Epidemiology

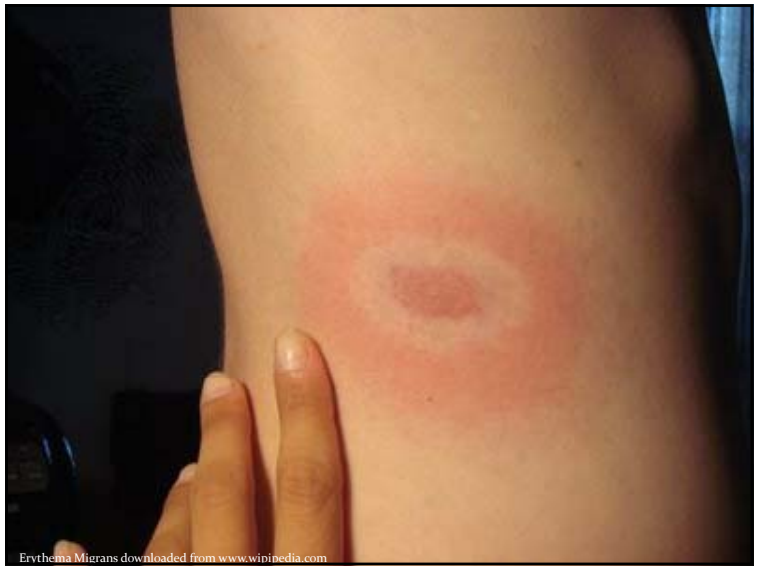
- Caused by three species of *Borrelia*
- *Borrelia burgdorferi* is the causative agent in the U.S.
- *Ixodes* ticks are the vector of transmission and rodents (white-footed mouse) are the reservoir
  - Deer are required to support the tick population, but are not a reservoir for human infection
- All ages are affected
  - Bimodal distribution (5-9 and 55-59 years)

Epidemiology

- Highest prevalence of disease is in the Northeast, however infections have occurred in almost all states
- Highest incidence of Lyme disease is during the summer months
- There is a significant incidence of co-infection with *Anaplasma phagocytophilum* (causative agent of Human Granulocytic Anaplasmosis) and *Babesia microti* (causative agent of Babesiosis)

Clinical Manifestations

- Early localized disease (usually within one month)
  - Appearance of Erythema Chronicum Migrans rash
    - Typically appears between one day and one month after infection
    - Classically appears as an erythematous lesion with central clearing or a bulls-eye appearance
    - Can occur as uniform erythema and rarely with central necrosis or vesicles
    - Multiple lesions indicate spirochetemia
  - Pathognomonic sign of Lyme disease and presence warrants treatment



Clinical Manifestations

- Early Localized Disease
  - Non-specific signs and symptoms

Fatigue	Myalgias
Anorexia	Arthralgias
Headache	Lymphadenopathy
Neck Stiffness	Fever

  - Laboratory Abnormalities
    - ESR may be elevated
    - Leukocytosis not common
    - No distinctive findings

Clinical Manifestations

- Early Disseminated Disease (weeks to months)
  - Neurologic Disease

Lymphocytic Meningitis	Mononeuropathy multiplex
Unilateral or bilateral cranial nerve palsy	Cerebellar ataxia (rare)
Radiculopathy	Encephalomyelitis (rare)
Peripheral neuropathy	

  - Classic triad is meningitis, cranial nerve palsy and motor or sensory radiculopathy
  - Suspect Lyme disease with bilateral VII nerve palsies

Clinical Manifestations

- Carditis
  - Occurs in approximately 5% of Lyme infections
  - Common manifestations

Palpitations	Myocarditis
Conduction Abnormalities	Left ventricular failure

  - Varying degrees of A-V block is the most common conduction abnormality
  - First degree AVB can rapidly progress to complete heart block

Clinical Manifestations

- Complete heart block occurs in up to 50% of patients with Lyme carditis
- 38% of patients in one study required a temporary pacemaker
- Usually resolves within one week of treatment
- Myopericarditis is usually mild and self-limited
  - Most commonly manifests as non-specific ST and T wave abnormalities
  - Rarely leads to transient cardiomegaly or pericardial effusion

Clinical Manifestations

- Late disease (months to years)
  - May not have an identifiable history of early or disseminated disease
  - Lyme Arthritis
    - Intermittent or persistent pauciarticular arthritis, especially of large joints
    - Can resolve spontaneously or become chronic
    - Knees are the most commonly affected joint

Clinical Manifestations

- Neurologic
  - Lyme encephalopathy
    - Characterized by mild cognitive disturbances
  - Chronic axonal polyneuropathy
    - Characterized by spinal radicular pain or parasthesias

Clinical Manifestations

- Post-Lyme Disease Syndrome
  - Occurs after appropriate antibiotic therapy
  - Clinical manifestations

Headache	Myalgias
Fatigue	Cognitive impairment
Arthralgias	

  - Typically gradually resolves over six months to a year

Diagnosis

- Early Lyme disease diagnosis can be made clinically with the presences of Erythema Migrans
- Serology testing should be reserved for patients in which there is a suspicion for Lyme disease in the absence of the rash

Diagnosis

- The recommended testing is an ELISA followed by a confirmatory Western blot
  - ELISA is associated with a high rate of false positives
- Only 20 to 40 % of patients will be seropositive at initial presentation
- Acute and convalescent (two to four weeks later) testing may be helpful
- PCR testing for *Borrelia* is possible, but has a low sensitivity

Treatment

- Appropriate antibiotic treatment prevents complications, including Lyme carditis
- Oral agents that are efficacious include:
  - Doxycycline
  - Amoxicillin
  - Cefuroxime
- Doxycycline also treats *Anaplasma*
- Doxycycline is contraindicated in patients less than 8 and pregnant or breast-feeding women

Treatment

- Duration of therapy should be 14-21 days
- Up to 15% of patients will have a Jarish-Herxheimer reaction (transient worsening with initial treatment due to immune response)

Treatment

- Acute neurologic manifestations and carditis
  - Require intravenous antibiotics
  - Efficacious agents:
    - Ceftriaxone 2 grams daily
    - Cefotaxime 2 grams every 8 hours
    - Penicillin G 18-24 million units divided into 6 doses daily
  - Duration is from 14-28 days
  - Can be transition to oral therapy when heart block resolves
- Antibiotics can also be used to treat late Lyme disease
  - Recommended 28 day course of IV ceftriaxone

Disposition

- Well-appearing patients with early Lyme disease can be managed as an outpatient with oral antibiotics
- Disseminated disease should probably be treated as an inpatient
- Patients with carditis should be managed in the ICU with telemetry

References

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