UVM Project ECHO: Lyme Disease and Tick-borne Illness

Late Lyme Arthritis and Post-treatment Lyme Disease Syndrome

Speaker:
Jean Dejace, MD

Date:
August 16, 2019
What we’re going to talk about

• Late Lyme Disease: arthritis

• Post-Treatment Lyme Disease Syndrome
What we’re not going to talk about

• Late Neurologic Lyme

• Why?
Lyme encephalomyelitis — European patients who have Bannwarth syndrome with radicular symptoms (see 'Bannwarth syndrome' above) occasionally have segmental spinal cord involvement at the same level as the affected nerve root [32,33]. This has been emphasized far less in the United States literature, but it can occur there as well. There have been rare observations in both the United States and Europe of an inflammatory encephalomyelitis associated with Lyme disease [34-36]. Lyme encephalomyelitis represents a true infection of the neuraxis (table 4) that can superficially resemble multiple sclerosis, with inflammatory-appearing parenchymal abnormalities on brain or spinal cord MRI and inflammatory changes in the cerebrospinal fluid, including increased total immunoglobulin synthesis and oligoclonal bands. Years ago this disorder was estimated to occur in one person per million at risk per year. The true incidence is probably even lower now that Lyme disease is better recognized and more likely to be treated early.
The Clinical Assessment, Treatment, and Prevention of Lyme Disease, Human Granulocytic Anaplasmosis, and Babesiosis: Clinical Practice Guidelines by the Infectious Diseases Society of America

Gary P. Wormser,1 Raymond J. Dattwyler,2 Eugene D. Shapiro,5,6 John J. Halperin,3,4 Allen C. Steere,9 Mark S. Klempner,10 Peter J. Krause,8 Johan S. Bakken,11 Franc Strle,13 Gerold Stanek,14 Linda Bockenstedt,7 Durland Fish,6 J. Stephen Dumler,12 and Robert B. Nadelman1

Divisions of 1Infectious Diseases and 2Allergy, Immunology, and Rheumatology, Department of Medicine, New York Medical College, Valhalla, and 3New York University School of Medicine, New York, New York; 4Atlantic Neuroscience Institute, Summit, New Jersey; Departments of 5Pediatrics and 6Epidemiology and Public Health and 7Section of Rheumatology, Department of Medicine, Yale University School of Medicine, New Haven, and 8Department of Pediatrics, University of Connecticut School of Medicine and Connecticut Children’s Medical Center, Hartford; 9Division of Rheumatology, Allergy, and Immunology, Massachusetts General Hospital, Harvard Medical School, and 10Boston University School of Medicine and Boston Medical Center, Boston, Massachusetts; 11Section of Infectious Diseases, St. Luke’s Hospital, Duluth, Minnesota; 12Division of Medical Microbiology, Department of Pathology, The Johns Hopkins Medical Institutions, Baltimore, Maryland; 13Department of Infectious Diseases, University Medical Center, Ljubljana, Slovenia; and 14Medical University of Vienna, Vienna, Austria
Background and Diagnosis of Late Neurologic Lyme Disease

Late neurologic Lyme disease may present as encephalomyelitis, peripheral neuropathy, or encephalopathy [149–152, 208–212]. Because most patients with Lyme disease are now diagnosed and treated early in the course of infection, these more indolent forms of neurologic Lyme disease are quite rare. Encephalomyelitis is a unifocal or multifocal inflammatory CNS disease [152, 213]. Collectively, only 1 patient with encephalomyelitis has been diagnosed over the past 5 years by panel members (G.P.W., J.J.H., R.B.N., R.J.D., A.C.S., E.D.S., M.S.K., P.J.K., J.S.B., and L.B.), in spite of both community-based and referral clinical practices. This severe neurologic manifestation of Lyme disease has been diagnosed primarily in Europe.
Background and Diagnosis of Late Neurologic Lyme Disease

Late neurologic Lyme disease may present as encephalomyelitis, peripheral neuropathy, or encephalopathy [149, 150, 208, 212]. Lyme disease–associated encephalopathy is an imprecisely defined clinical entity characterized by mild abnormalities of memory and cognitive functions that are demonstrable either by a careful mental status examination or by formal neuropsychologic testing [211, 222]. Panel members (G.P.W., J.J.H., R.B.N., R.J.D., A.C.S., E.D.S., M.S.K., P.J.K., J.S.B., and L.B.) have diagnosed only 7 patients over the past 5 years. J.S.B., and L.B.), in spite of both community-based and referral clinical practices. This severe neurologic manifestation of Lyme disease has been diagnosed primarily in Europe.
Clinical Features of Late Lyme Disease

• Arthritis
  • Most commonly occurs months after infection
    • Can be weeks or years
    • Can present in colder months, when other forms less common
  • Eventually develops in ~60% of untreated patients
  • Currently in ~25% of reported cases
    • More patients diagnosed and treated in early stages
    • Remains most common manifestation of disseminated disease
Clinical Features of Late Lyme Disease

• Arthritis
  • Objective evidence of joint inflammation
    • warmth, swelling, redness
    • contrast: diffuse arthralgias can occur in early disease
  • Mono or oligoarticular
    • In either case, typically involves the knee
    • Other large joints or TMJ can be involved
  • Pain relatively minimal and fever rare
    • Contrast with septic arthritis
  • Intermittent
    • Episodes of arthritis last weeks to months if untreated
Clinical Features of Late Lyme Disease

• Arthritis

• Diagnosis
  • Objective evidence of joint inflammation + serology
  • Synovial fluid analysis: cell count, crystals, culture
    • Establish presence of inflammatory arthritis (i.e. elevated WBC)
    • Rule out other etiologies (septic arthritis, crystal arthropathy)
    • Lyme: typically mild/moderate elevation in WBC <25,000
Treatment of Late Lyme Disease

• Arthritis
  • PO therapy is preferred (decreased cost and side-effects)
    • Doxycycline 100mg BID for 28 days
    • Amoxicillin 500mg TID for 28 days
    • Cefuroxime 500mg BID for 28 days
  • Symptoms often slow to resolve
  • If persistent symptoms weeks to months after initial Rx
    • Either:
      • Repeat PO therapy x28 days (typically if incomplete response)
      • IV ceftriaxone x28 days (typically if little to no response to PO)
Treatment of Late Lyme Disease

• Arthritis
  • If symptoms persist after two courses of antibiotics
    • Trial NSAIDs or hydroxychloroquine
    • Consider methotrexate if severe
  • If symptoms still persist for several months
    • Consider arthroscopic synovectomy
Diagnosis and Treatment of Lyme Arthritis

Sheila L. Arvikar, MD, Allen C. Steere, MD

KEYWORDS

- Lyme disease
- Borrelia burgdorferi
- Lyme arthritis
- Antibiotic-refractory arthritis
- Inflammatory arthritis

KEY POINTS

- Lyme arthritis is a late disease manifestation, usually beginning months after the tick bite. Patients may not report an antecedent tick bite or erythema migrans.
- Patients have intermittent or persistent attacks of joint swelling and pain, primarily in 1 or a few large joints, especially the knee, without prominent systemic manifestations.
- The diagnosis is supported by 2-tier serologic testing for Borrelia burgdorferi by enzyme-linked immunosorbent assay and immunoglobulin G Western blotting.
- Initial treatment is a 30-day course of oral doxycycline or amoxicillin. For patients with an insufficient response to oral treatment, intravenous therapy with ceftriaxone is recommended.
- A minority of patients may have persistent synovitis for months or several years after oral and intravenous antibiotic therapy, which is treated with antiinflammatory agents, disease-modifying antirheumatic drugs, or synovectomy.
Review: Possible Indications for IV Therapy

• There are 3
  • Neurologic disease
  • Advanced atrioventricular block
  • Refractory arthritis

• PO therapy is otherwise the standard of care.
Life After Lyme

Long-term Follow-up of Patients with Culture-Confirmed Lyme Disease

John Nowakowski, MD, Robert B. Nadelman, MD, Rebecca Sell, Donna McKenna, L. Frank Cavaliere, MD, Diane Holmgren, Adriana Gaidici, MD, Gary P. Wormser, MD

PURPOSE: To determine the long-term outcome of patients with culture-confirmed Lyme disease.
METHODS: We analyzed data collected prospectively on adult patients from a highly endemic area in New York State who were diagnosed with early Lyme disease between 1991 and 1994. Patients with culture-confirmed erythema migrans were evaluated at baseline, 7 to 10 days, 21 to 28 days, 3 months, 6 months, 1 year, and annually thereafter. All patients were treated with antibiotics at the time of diagnosis.
RESULTS: We evaluated 96 cases on 709 separate occasions (median, eight evaluations per case). The erythema migrans rash resolved within 3 weeks in all of the 94 evaluable cases, none of whom developed an objective extracutaneous manifestation of Lyme disease. Of the 81 cases who were followed for ≥1 year, all but 8 (10%) were asymptomatic at their last visit, a mean (± SD) of 5.6 ± 2.6 years into follow-up, and only 3 (4%) were symptomatic at every follow-up visit. Intercurrent tick bites were reported by 45 cases (47%), and 14 (15%) developed a second episode of erythema migrans. Four other cases who were asymptomatic seroconverted between years 2 and 5.
CONCLUSION: The long-term outcome of patients with erythema migrans after antibiotic therapy was excellent, but patients from a highly endemic area in New York State remained at high risk of re-exposure to ticks and reinfection. Subjective symptoms during follow-up evaluations tended to be mild to moderate, intermittent, and associated with more symptomatic illness at the time of initial diagnosis. Am J Med. 2003;115:91–96. ©2003 by Excerpta Medica Inc.
• 96 patients with erythema migrans
  • All treated with short course antibiotics on presentation
  • All evaluable patients (94/96) resolved EM at 3 wks
• No objective findings of late Lyme disease in any patient
• Asymptomatic
  • >50% at 10 days
  • 80% at 28 days
  • 90% at 6 months
Chronic, Non-Specific Symptoms

• Fatigue

• Muscle and joint aches without objective clinical or laboratory evidence of inflammation

• Difficulty concentrating, mental “slowness”

• Post-Treatment Lyme Disease Syndrome
  • often referred to as “chronic Lyme”
Chronic, Non-Specific Symptoms

• Is there a basis for Lyme as a chronic infection?
  • DNA (PCR) has been found in tissue after antibiotic treatment in animals.
  • Overwhelmingly, no borrelia has grown from culture after treatment in these animal experiments (i.e. active division suggesting a viable pathogen).
  • There is no true animal model for PTLDS or “chronic Lyme” because the symptoms are subjective and the animals can’t tell you if they have e.g. fatigue or joint pain.

• More here: https://www.cdc.gov/lyme/pdfs/PersistenceTranscript.pdf
  https://www.cdc.gov/lyme/pdfs/PersistenceWebinarSlides.pdf
Critical analysis of a doxycycline treatment trial of rhesus macaques infected with *Borrelia burgdorferi*

Gary P. Wormser a,*, Susan O'Connell b, Andrew R. Pachner c, Ira Schwartz d, Eugene D. Shapiro e, Gerold Stanek f, Franc Strle g

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d Department of Microbiology and Immunology, New York Medical College, Valhalla, NY, USA
e Departments of Pediatrics, of Epidemiology of Microbial Diseases, and of Investigative Medicine, Yale University, New Haven, CT 06520, USA
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These animal findings have led to controversy in the lay community regarding human Lyme disease, however there is a strong consensus within the medical community regarding antibiotic therapy.

[Link to ECCMID Poster](https://www.aldf.com/pdf/ECCMID_Poster_4.2_2.10.pdf)
Lyme borreliosis treatment

Daniela Vaňousová & Jana Hercogová
Department of Dermatovenereology, 2nd Medical School, Charles University, University Hospital Bulovka, Prague, Czech Republic

Finn Sellebjerg, Neurologisk afdeling, Rigshospitalet, Region Hovedstaden
Sigurdur Skarphedinsson, Infektionsmedicinsk afdeling Q, Odense Universitetshospital, Region Syddanmark
Christian Østergaard, Klinisk Mikrobiologisk afdeling, Hvidovre Hospital, Region Hovedstaden

Kutane Lyme Borreliose
Unorthodox Alternative Therapies Marketed to Treat Lyme Disease

Paul M. Lantos,1 Eugene D. Shapiro,2 Paul G. Auwaerter,3 Phillip J. Baker,4 John J. Halperin,5,6 Edward McSweegan,7 and Gary P. Wormser8

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(See the Editorial Commentary by Steere and Arvikan on pages 1783–5.)

Background. Some patients with medically unexplained symptoms or alternative medical diagnoses suspect that they chronically suffer from the tick-borne infection Lyme disease. These patients are commonly targeted by providers of alternative therapies. This study was designed to identify and characterize the range of unorthodox alternative therapies advertised to patients with a diagnosis of Lyme disease.

Methods. Internet searches using the Google search engine were performed to identify the websites of clinics and services that marketed nonantimicrobial therapies for Lyme disease. We subsequently used the PubMed search engine to identify any scientific studies evaluating such treatments for Lyme disease. Websites were included in our review so long as they advertised a commercial, nonantimicrobial product or service that specifically mentioned utility for Lyme disease. Websites with patient testimonials (such as discussion groups) were excluded unless the testimonial appeared as marketing on a commercial site.
### Table 1. Examples of Alternative Medical Therapies Marketed to Patients for the Treatment of Lyme Disease

<table>
<thead>
<tr>
<th>Categories of Therapy</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Oxygen</td>
<td>Hyperbaric oxygen, Hydrogen peroxide, Ozone</td>
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<tr>
<td>Energy and radiation</td>
<td>Ultraviolet light, Photon therapy, “Cold” lasers, Saunas and steam rooms, “Rife” therapy (electromagnetic frequency treatments), Magnets</td>
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<tr>
<td>Metal/chelation</td>
<td>Mercury chelation and removal, Dimercaptosuccinic acid (DMSA), 2,3-Dimercapto-1-propanesulfonic acid (DMPS), Alpha lipoic acid (ALA), Ethylene diamine tetraacetic acid (EDTA), Removal of dental amalgam, Colloidal silver, Bismuth</td>
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<tr>
<td>Biological and pharmacologic</td>
<td>Urotherapy (urine ingestion), Enemas, Bee venom, Hormonal therapy, Dihydroepiandrosteronedione, Pregnenolone, Cortisone, Hydrocortisone, Synthetic thyroid hormone, Lithium orotate, Olmesartan, Cholestyramine, Naltrexone, Sodium chlorite (bleach), Intravenous immune globulin (IVIG), Apheresis, Stem cell transplantation</td>
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<tr>
<th>Nutritional supplements</th>
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| Vitamins C and B12,
| Herbs, Garlic, cilantro, Chlorella, Sarsaparilla, Andrographis, Turmeric, Olive leaf, Cat’s claw,
| Burnt mugwort (moxibustion), Glutathione, Fish oil, Magnesium, Salt |

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**The University of Vermont**

**Larner College of Medicine**

**Office of Primary Care & AHEC Program**

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**ECHO University of Vermont**
New Stem Cell Treatment

Lyme Disease Breakthrough

- No known negative side effects
- Painless Procedure
- Limited Space Available
- Commonly, significant positive results are seen in three to six months

Contact Us Now We Can Help!

Where are you located?
Stem Cell Of America has offices in the United States and a treatment center in Mexico.
Persistent Non-Specific Symptoms

• 4 notable randomized human trials regarding prolonged antibiotic therapy for Lyme have been published. They reached similar conclusions.
  • New England Journal of Medicine 2001
  • Neurology 2003
  • Neurology 2008
  • New England Journal of Medicine 2016
TWO CONTROLLED TRIALS OF ANTIBIOTIC TREATMENT IN PATIENTS WITH PERSISTENT SYMPTOMS AND A HISTORY OF LYME DISEASE

MARK S. KLEMPNER, M.D., LINDEN T. HU, M.D., JANINE EVANS, M.D., CHRISTOPHER H. SCHMID, PH.D., GARY M. JOHNSON, RICHARD P. TREVINO, B.S., DELONA NORTON, M.P.H., LOIS LEVY, M.S.W., DIANE WALL, R.N., JOHN MCCALL, MARK KOSINSKI, M.A., AND ARTHUR WEINSTEIN, M.D.
• 115 patients
  • 57 with positive IgG Western Blot
  • 58 with history of EM but negative serology
  • 1 or more: diffuse MSK pain, cognitive impairment, radicular pain, paresthesias or dysesthesias
  • All had been previously treated

• Randomized into 2 groups
  • Treatment: 30 days IV ceftriaxone then 60 days PO doxycycline
  • Placebo: 30 days IV dextrose then 60 days PO placebo
Results

- Primary outcome: improvement in Quality of Life
  [https://www.rand.org/content/dam/rand/www/external/health/surveys_tools/mos/mos_core_36item_survey.pdf]
- Measured at 30, 60, 180 days
- Trial stopped when interim analysis of 115 patients at 180 days showed no significant difference
Study and treatment of post Lyme disease (STOP-LD)

A randomized double masked clinical trial

L.B. Krupp, MD; L.G. Hyman, PhD; R. Grimson, PhD; P.K. Coyle, MD; P. Melville, RN; S. Ahnn, PhD; R. Dattwyler, MD; and B. Chandler, MPA
Neurology 2003

• 55 patients
  • History of physician documented EM or late Lyme disease with positive serology
  • Severe fatigue (score >4) on Fatigue Severity Scale
  • All treated with standard therapy within past 6 months

• Randomized into 2 groups:
  • 28 days IV ceftriaxone
  • Placebo
• Results at 6 months
  • Primary outcomes
    • 1. change in score on fatigue scale
    • 2. cognitive speed/impairment as measured by A-A Test
    • 3. clearance of OspA Ag in CSF
  • Fatigue
    • 9.1% improvement in the placebo group: mean score 5.5
    • 22.1% improvement in ceftriaxone group: mean score 4.4
  • No significant difference in cognitive or biologic outcomes
Neurology 2003

• Should we prescribe ceftriaxone?
  • Is the improvement in fatigue clinically significant?
    • Antibiotic group still >4 (severe fatigue)
  • 4 of 55 patients (7%) experienced life-threatening adverse events
• The authors conclude “STOP-LD...suggests that repeated courses of antibiotic treatment are not indicated for persistent symptoms following Lyme disease including those related to fatigue and cognitive dysfunction, particularly in light of the frequency of serious adverse events.”
A randomized, placebo-controlled trial of repeated IV antibiotic therapy for Lyme encephalopathy

ABSTRACT

Background: Optimal treatment remains uncertain for patients with cognitive impairment that persists or returns after standard IV antibiotic therapy for Lyme disease.

Methods: Patients had well-documented Lyme disease, with at least 3 weeks of prior IV antibiotics, current positive IgG Western blot, and objective memory impairment. Healthy individuals served as controls for practice effects. Patients were randomly assigned to 10 weeks of double-masked treatment with IV ceftriaxone or IV placebo and then no antibiotic therapy. The primary outcome was neurocognitive performance at week 12—specifically, memory. Durability of benefit was evaluated at week 24. Group differences were estimated according to longitudinal mixed-effects models.
Neurology 2008

• 37 patients
  • history of Lyme symptoms
  • positive IgG Western Blot
  • memory impairment
  • already received 3 weeks ceftriaxone

• Randomized
  • 23 received 10 weeks ceftriaxone
  • 14 received IV placebo
Neurology 2008

• Results
  • Primary outcome
    • Neurocognitive performance as measured by index score incorporating motor, psychomotor, attention, memory, verbal fluency
  • At 12 weeks
    • Some improvement in drug-treated group compared to placebo
  • At 24 weeks
    • Improvement was not sustained in the drug-treated group
Neurology 2008

• 26% of ceftriaxone group experienced adverse effects.

• Authors’ conclusion:
  • “considering both the limited duration of cognitive improvement and the risks, 10 weeks of IV ceftriaxone...is not an effective strategy for sustained cognitive improvement”
Randomized Trial of Longer-Term Therapy for Symptoms Attributed to Lyme Disease

Anneleen Berende, M.D., Hadewych J.M. ter Hofstede, M.D., Ph.D., Fidel J. Vos, M.D., Ph.D., Henriët van Middendorp, Ph.D., Michiel L. Vogelaar, M.Sc., Mirjam Tromp, Ph.D., Frank H. van den Hoogen, M.D., Ph.D., A. Rogier T. Donders, Ph.D., Andrea W.M. Evers, Ph.D., and Bart Jan Kullberg, M.D., Ph.D.
280 patients
- History of clinical Lyme disease or positive serology
- Persistent symptoms attributed to Lyme
  - MSK pain, arthralgia, neuralgia, sensory disturbance, cognitive disturbance, fatigue etc..
- All received 14 days of IV ceftriaxone initially

Randomized
- 12 weeks PO doxycycline
- 12 weeks PO clarithromycin-hydroxychloroquine
- 12 weeks PO placebo
• Results
  • Primary outcome: quality of life measured by SF-36
  • All 3 groups showed improvement from baseline at 14 weeks
  • No significant difference was found between the study groups
Prolonged Antibiotics

• Theories regarding possible benefits remain untested hypotheses.

• No human trial data shows overall benefit.

• The best current clinical data does not support prolonged courses of antibiotics for post-treatment Lyme disease syndrome.
Consequences of Overdiagnosis and Inappropriate Antibiotic Therapy

Morbidity and Mortality Weekly Report

Serious Bacterial Infections Acquired During Treatment of Patients Given a Diagnosis of Chronic Lyme Disease — United States

Natalie S. Marzec, MD¹; Christina Nelson, MD²; Paul Ravi Waldron, MD³; Brian G. Blackburn, MD⁴; Syed Hosain, MD⁵; Tara Greenhow, MD⁶; Gary M. Green, MD⁶; Catherine Lomen-Hoerth, MD, PhD⁷; Marjorie Golden, MD⁸; Paul S. Mead, MD²
Death Due to Community-Associated *Clostridium difficile* in a Woman Receiving Prolonged Antibiotic Therapy for Suspected Lyme Disease

To the Editor—*Clostridium difficile* infections can occur outside the hospital in association with antibiotic use and can result in fulminant colitis and death. In December 2009, the Minnesota Department of Health investigated a death due to *C. difficile* of a 52-year-old woman with no recent hospitalizations.

In June 2009, the patient sought care for symptoms of fatigue, insomnia, achy joints, memory loss, and confusion. These symptoms had been present for >5 years.
Death from Inappropriate Therapy for Lyme Disease

A 30-year-old woman died as a result of a large *Candida parapsilosis* septic thrombus located on the tip of a Groshong catheter. The catheter had been in place for 28 months for administration of a 27 month course of intravenous cefotaxime for an unsubstantiated diagnosis of chronic Lyme disease.
Neoplasms Misdiagnosed as “Chronic Lyme Disease”
Clinical features of Lyme disease include erythema migrans rash, facial palsy, arthritis, and peripheral neuropathy. In endemic areas, patients with erythema migrans can be diagnosed clinically. Otherwise, diagnosis is based on the history of possible exposure, compatible clinical features, and positive 2-tier serologic testing.¹

Chronic Lyme disease is a loosely defined diagnosis given by a small number of physicians—who are not usually infectious disease experts—to patients with various nonspecific symptoms, including patients with no objective evidence of Lyme disease.² In addition to adverse outcomes from unconventional treatments for chronic Lyme disease,³ ⁴ patients misdiagnosed with chronic Lyme disease may be harmed when their actual condition remains untreated.

We report 3 cases in which diagnosis of the patients’ actual conditions was delayed due to the misdiagnosis of chronic Lyme disease. Institutional review board approval was not obtained for this case series because it did not meet the regulatory definition of research and was outside the scope of institutional review board requirements. All 3 patients gave written informed consent to share their medical records for this case series.
Long-term Assessment of Health-Related Quality of Life in Patients With Culture-Confirmed Early Lyme Disease

Gary P. Wormser,¹ Erica Weitzner,¹ Donna McKenna,¹ Robert B. Nadelman,¹ Carol Scavarda,¹ Irida Molla,¹ Rhea Dornbush,² Paul Visintainer,³ and John Nowakowski¹

¹Division of Infectious Diseases, and ²Department of Psychiatry, New York Medical College, Valhalla; and ³Baystate Medical Center, Springfield, Massachusetts
• 100 patients with erythema migrans recruited 1991-2000
  • Treated on presentation
  • Assessed 2011-2013
  • Outcome: Health Related Quality of Life by SF-36v2

• Results:
  • Mean follow-up 15.4 years
  • Scores similar to general US population
<table>
<thead>
<tr>
<th><strong>DATES</strong></th>
<th><strong>SESSION</strong></th>
<th><strong>DIDACTIC TOPICS (in addition to case review)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>May 17</td>
<td>TeleECHO Session #1</td>
<td>• Orientation to Project ECHO&lt;br&gt;• Program Overview&lt;br&gt;• Anatomy of teleECHO Session&lt;br&gt;• Case Presentation Templates&lt;br&gt;• Tick-borne Illness/Epidemiology</td>
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<tr>
<td>June 21</td>
<td>TeleECHO Session #2</td>
<td>• Early localized Lyme diagnosis, treatment, and interpreting tests</td>
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<td>July 19</td>
<td>TeleECHO Session #3</td>
<td>• Early disseminated and late Lyme diagnosis and treatment (cardiac, rheumatologic, neurologic)</td>
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<td>August 16</td>
<td>TeleECHO Session #4</td>
<td>• Chronic Lyme Disease</td>
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<tr>
<td>Sept 20</td>
<td>TeleECHO Session #5</td>
<td>• Anaplasmosis</td>
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<td>October 25</td>
<td>TeleECHO Session #6</td>
<td>• Other tickborne diseases (babesiosis, etc.)</td>
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