

## A Review on Lyme Borreliosis

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**Abstract** - Lyme infection or Lyme borreliosis is a spirochetosis sent by tick chomp. The most well-known clinical sign is erythema migrans. It is the most well-known tick-borne sickness in the northern half of the globe. It is a fundamental sickness, brought about by a whip bacterium near treponema pallidum syphilis of the variety *Borrelia burgdorferi sensu lato* (basically *B. garinii*, *B. afzelii*, *B. burgdorferi sensu stricto*), sent by the nibble of a tick of the variety (*Ixodes ricinus* in Europe). The microbe can spread haematogenous to different tissues and organs, including essentially the sensory system, joints, and skin. Finding depends on anamnestic, clinical and natural contentions. Organic tests, mostly dependent on serology, are fundamental for the conclusion of the sickness, except for erythema migrans, the finding of which should remain rigorously clinical. The treatment depends on the utilization of one of the accompanying 3 classes of anti-toxins:  $\beta$ -lactams, cyclins or macrolides, for a span of 2 to about a month relying upon the clinical setting. Notwithstanding the insurance against tick nibbles, the best individual preventive measure is, if there should arise an occurrence of openness, early discovery and evacuation of ticks joined to the skin.

**Index Terms** - Lyme disease:-*Borrelia Burgdorferi*; *Ixodes*; Erythema Migrans, Treatment, Diagnosis, Prophylaxis.

### INTRODUCTION

Lyme sickness (borreliosis) is one of the maximum not unusual place vector-borne sicknesses worldwide. Its prevalence and geographic enlargement has been progressively growing with inside the final decades. Its prevalence and geographic enlargement has been progressively growing with inside the final decades.

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scientific polymorphism, evolving schematically in 3 phases, number one focal cutaneous contamination, secondary tissue contamination focused, and tertiary in which the focal manifestations evoke a twin mechanism, infectious and / or inflammatory, even dysimmunity. Its severity is associated with cardiac and neurological disorders, in addition to to ability lymphomas that could complicate the evolution of borreliosis. Joint or eye harm can result in sizeable morbidity. Indeed, because the maximum normal vector-borne sickness with inside the Northern Hemisphere, Lyme sickness is more and more identified as escalating public fitness hazard that needs modern techniques for prevention and care. The goal of this text is to study the scientific analysis and remedy of *B. burgdorferi* contamination for the front-line clinician.

#### CAUSAL AGENT

Lyme borreliosis is due to spirochetes, spiral microorganism belonging to the order Spirochaetales, the own circle of relatives Spirochaetaceae and the genus *Borrelia*. The species accountable for Lyme borreliosis are grouped with inside the complicated *Borrelia burgdorferi sensu lato* (*B. burgdorferi* sl) [4]. It has species and one genomospecies. Three species are pathogenic in humans: *B. burgdorferi*, *B. garinii* and *B. afzelii*. In the United States, *B. burgdorferi* ss is the simplest species remoted via way of means of subculture of human samples. In Europe: *B. garinii* and *B. afzelii* are greater frequently on the beginning of the sickness and also are most usually located with inside the vector tick. The microorganism of the genus *Borrelia* have a helicoidal morphology and a feature mobility, with a duration of four to 30  $\mu\text{m}$  and a diameter of 0.2 to 0.5  $\mu\text{m}$  with a selected ultrastructure which consists, from the interior closer to outside, via way of means of the protoplasmic cylinder, the periplasmic area and the outer membrane [4]. The flagella exist beneath the outer membrane, permitting the spirochaetes to move. The *Borrelia* wall shape is analogous to the Gram-bad bacterial wall, however does now no longer gram-unfastened with lipopolysaccharide. The genetic cloth of *B. burgdorferi* is polymorphic with presence of each a chromosome and linear plasmids. Their wonderful organ tropism is properly documented: *B. burgdorferi* ss: easily reasons arthritis, greater not unusual place with inside the United States than in Europe. *B.*

*garinii*: its neurotropic debts for the excessive frequency of neurological paperwork in Europe, especially in France *B. afzelii*: is the fundamental agent of persistent atrophic acrodermatitis discovered simplest in Europe.

#### Epidemiology

Incidence and Geographical Distribution J Dermal Skin Lyme borreliosis is the maximum not unusual place vector-borne disorder with inside the northern hemisphere. It happens in Europe, North America, Asia and a few Maghreb countries, following the geographical distribution of its vector. It seems as rising disorder, with inside the United States, with growing incidence, and attention of instances in a dozen northern states. Rare instances were stated in tropical Africa, the primary in Côte d'Ivoire, observed through Burkina Faso, South Africa, Zimbabwe, Mozambique, and Europeans [5,6]. The overall range of showed instances is extra than 30,000 annually. Professional activities (forestry), leisure activities in wooded and humid regions divulge to infection. The favourable duration extends from May to August, whilst ticks are in search of their food, a duration of height tick pastime from early spring to past due autumn. The antihuman contaminations are exceptional: Trans placental, through blood transfusion, after autologous transplantation of chondrocytes, however now no longer through breastfeeding. Information from surveillance statistics concerning the intercourse of instances indicated that maximum instances have been male individuals (56.7%). The extensive majority have been white (89.7%) observed through different race (6.8%), black (1.6%), Asian/Pacific Islander (1.5%), and American Indian/Alaska Native (<1%). Patient age turned into to be had in 89.6% of the facts and indicated a bimodal distribution with peaks at a while five to nine years and 50 years. Vectors, Hosts and Germ Reservoirs Lyme disorder are normally due to the spirochete *Borrelia burgdorferi* with inside the United States. This bacterial spirochete happens maximum often in small vertebrates and is transmitted to human beings through bites through the *Ixodes scapularis* or *Ixodes pacificus* ticks, normally referred to as deer ticks or black-legged ticks [9]. The hosts are small mammals, rodents. In the United States, the principle reservoir of sprouts is the white-footed mouse, *Peromyscus leucopus*. In Europe, the fauna

worried appears very diverse (mammals, birds, reptiles). Survival of tick vectors calls for that they defend themselves from desiccation beneath Neath inexperienced cowl in wooded rural regions, peri-city regions, gardens, hedges, leisure regions or even public parks. The difficult tick is infested at some point of its meal on an inflamed mammal effect, which *Borrelia* will expand with inside the mite. Disease transmission to human beings calls for the want for the tick to ingest a blood meal to convert to their subsequent degree of development. Once connected to the host, the tick inserts its valuable piercing agent, known as a hypostome, into the host's pores and skin. Ixodes ticks secrete a cementing fabric to the pores and skin for added attachment, in addition to anticoagulants, immunosuppressive, and anti-inflammatory. These materials permit the pathogens to by skip to the host and additionally might also additionally modify the host's attention to the tick chew. The tick wishes to stay in region among 24 and 40Hrs for transmission of the pathogen to occur.

#### Pathogenesis Contamination

Circumstances and Mechanisms Human, terminal host for the germ, will most usually be infected through the chew of nymphs as their small size (1 mm). The germ is to start with constant at the cells of the midgut of the tick vector through the OspA protein (outer floor protein A) that is anchored on a receptor TROPSPA (tick receptor for OspA). The arrival of warm blood reasons the replication of the germ and its migration into the salivary glands of the tick. The meal additionally reasons the expression of proteins permitting the colonization of the host: OspC, numerous adhesins, CRASP (supplement regulator-acquiring floor protein), even as the expression of OspA is reduced. In the United States, for the hazard of infection to end up important, the system of migration and 83 variation of the germ might require at the least 48 Hrs of attachment. *Scapularis* to his new host; in Europe the time required for infection is poorly recognized and can be shorter. Dissemination of the Germ In the pores and skin after which with inside the organs, *Borrelia* interacts with a huge type of specialised immune cells. It is without intrinsic proteolytic pastime, the bacterium diverts for its personal gain the personal structures of destruction of the host extracellular matrix. Activation of plasminogen to plasmin permits the bacterium to damage adjoining additives of the extracellular matrix

and basement membranes, thereby selling tissue migration and vascular penetration of the spirochaete. Tick saliva is an vital detail of the transmission and initiation stages and will increase the virulence of transmitted spirochetes Late Forms of the Disease In past due varieties of the disorder, mainly in persistent arthritis or arthritis proof against antibiotic therapy, the pathogenesis stays uncertain. Evidence of the endurance of a small range of germs with inside the joint is now and again furnished through the detection in their genome with inside the synovium, through gene amplification. The position of immune mechanisms is likewise mentioned in past due and persistent manifestations of the disorder or the absence of germs evaluation with the depth of inflammatory phenomena and immune response.

#### Natural History of the Disease Lyme

Disorder affords in 1 of three widespread ranges. Each level has awesome symptomatology, despite the fact that scientific functions can also additionally overlap, contributing to trouble in prognosis. The ranges of Lyme disorder are as follows: early localized disorder, early-disseminated disorder, and late-disseminated disorder. The maximum not unusual place presentation is early localized disorder. Erythema migrans (EM) is the conventional signal of early infection, indicating a focal cutaneous infection. The disseminated early section corresponds to the maximum florid section of the disorder wherein cutaneous, rheumatological, neurological, cardiological, ocular manifestations can occur. Late manifestations of germ dissemination are continual atrophic acrodermatitis and extracutaneous signs, mainly neurological and articular. Erythema Migrans Erythema migrans, firstly coined as erythema chronicum migrans through Azfeliuss, is the maximum common dermatologic manifestation of Lyme disorder. It is found in 70–95% of affected sufferers at some point of the primary three weeks of inoculation. It is extra common in youngsters than in adults. It affords as crimson to bluish-crimson, spherical or oval patch with centrifugal growth which can gift important clearing. It ought to degree five or extra cm despite the fact that most length is relatively variable. Topography varies relying at the bitten site. In youngsters, the maximum not unusual place areas affected are head and neck, and in grownup extremities or pelvis area. Systemic signs and symptoms consisting of malaise,

lymphadenopathy, and fever can also additionally accompany erythema migrans. Without treatment, the lesions can also additionally persist for weeks to months. The lesion develops some days to 3 weeks after infection, spreads spontaneously in numerous weeks, and then disappears in some months. The migration of EM is found handiest as soon as in 4 with inside the United States and appears even extra uncommon in France. If the prognosis changed into now no longer made on the preliminary level of the infection, the bacterium can unfold through haematogenous means, giving upward thrust to a fugitive bacteremia most customarily asymptomatic. It can bring about complications or fugitive and migratory arthromyalgia. The decision of the lesion is finished in some weeks, even with inside the absence of treatment. It disappears extra rapidly, inside some days, after initiation of antibiotic remedy and might go away a pigmental sequel.

#### Lyme Neuroborreliosis (LNB)

The neurologic manifestations of *B. burgdorferi* contamination typically gift with inside the early disseminated stage. It is the maximum not unusual place hassle in Europe, taking place in about 15% of untreated sufferers. LNB has a moderate preponderance in adult males and has a bimodal height affecting children/teenagers and adults over 50 years. LNB is specifically marked with the aid of using meningoradiculitis with lymphocytic meningitis. In children, remoted peripheral facial palsies are common manifestations of neuroborreliosis. Central lesions which include meningoencephalitis and myelitis are rarer.

#### Meningoradiculoneuritis

Garin-Bujadoux-Bannwarth syndrome (meningoradiculoneuritis) is the maximum not unusualplace manifestation of acute Lyme borreliosis in adults in Europe after erythema migrans. The signs of radiculitis expand on common four-6 weeks (1-18) after the tick chunk or after the erythema migrans. Segmental ache happens first, which intensifies at night time and whose localisation can change. Often the ache is first of all localised with inside the extremity wherein the tick chunk or erythema migrans changed into first observed. The affected person reports ache this is burning, nagging, stabbing or tearing in nature and responds best barely to traditional

analgesics. It regularly peaks inside some hours or days. Three-quarters of sufferers expand neurological deficits after 1-four weeks, and pareses are greater common than sensory disorders. Meningitis Isolated acute meningitis gift best four to 5% of NBL. The meningeal syndrome, if it exists, is by no means as excessive as in purulent meningitis. Meningitis is characterised with the aid of using slight headache, nausea, photophobia, neck stiffness. Because of scientific poverty, that meningitis can first of all pass ignored and consequently end up persistent.

#### Polyneuropathy

Polyneuropathy/polyneuritis's connected to a *Borrelia* contamination in European sufferers best in affiliation with acrodermatitis persistent atrophicans (ACA) in 48-64% of the instances. Isolated polyneuropathies/polyneuritis without different clean signs of Lyme borreliosis were diagnosed in 39-52% of American sufferers with Lymeborreliosis.

#### Achievement of Cranial Nerves

About 60 % of sufferers with Bannwarth's syndrome have cranial nerve deficits. All cranial nerves can be worried excluding the olfactory nerve. The facial nerve is affected in over 80 % of instances wherein there may be cranial nerve involvement. Involvement of the Central Nervous System (CNS)

#### Involvement of the CNS

CNS is uncommon and happens in best round four% of Lyme neuroborreliosis instances. Its onset is sluggish and it's far regularly persistent. The maximum not unusualplace manifestation is myelitis with spastic atactic gait disturbance and bladder dysfunction. Symptoms can expand overdays or numerous months. Some sufferers be afflicted by excessive tetra- or paraparesis. Other overdue LNB four J Dermatol Skin manifestations consist of persistent meningitis and encephalitis. Vasculitis crucial fearful involvement and stroke has additionally been more and more more identified as a overdue hassle of Lyme disease.

#### DIAGNOSTIC TESTS FOR LYME BORRELIOSIS

#### DIAGNOSTIC TECHNIQUES

##### Serological Tests

The organic prognosis of lyme sickness is therefore primarily based totally in exercise at the detection of

serology. All recommendations advise the two-tier serology for the serodiagnosis of Lyme borreliosis. The two-tier serology is first primarily based totally on an immunoenzymatic technique (ELISA) and then, if effective or equivocal, on a confirmatory immunoblot check (western blot, WB) with accelerated specificity. ELISA exams need to be used as first-line exams. Several research validated that one-tier (ELISA check by myself) and two-tier strategies (ELISA ± WB) had comparable performances. No look at has ever validated the prevalence of ELISA check by me as opposed to the two-tier strategy (ELISA ± WB). Seroconversion happens inside six weeks approximately, with IgG detection. Six weeks after signs onset, the serological check is related with > 90% sensitivity and specificity. Serology stays effective or even after powerful treatment, anti-Borrelia antibodies might also additionally persist for months or maybe years after healing. It is consequently of no need for tracking dealt with sufferers, and the presence of IgM isn't always synonymous with an energetic Borrelia infection. Also the direct detection of Borrelia with inside the blood at some stage in the section of bacteraemia isn't always indicated as it isn't always touchy enough.

#### Direct Biological Diagnosis

##### Culture

Culture is the reference organic diagnostic method, with 100% specificity however with constrained sensitivity due to the small number of microorganism on the sampling sites. There isn't any healthful carriage of *B. burgdorferi sensu lato*: isolation of the bacterium indicates active Lyme borreliosis. Culture is done in specialised laboratories. The tradition medium is specific (BSK), enriched, and it may easily be infected via way of means of commensal microorganism. Culture takes time (commonly 2–eight weeks), and bad outcomes are to be had most effective after three months. Spirochetes can't be detected via way of means of Gram staining at direct microscopic examination. A dark-area or section-contrast microscope is needed or direct immunofluorescence need to be used (slight sensitivity and specificity).

Diagnosis via way of means of Polymerase Chain Reaction (PCR) The specificity of *B. burgdorferi* DNA PCR detection need to be near 100%. The PCR sensitivity varies relying at the sickness level and its

localization. PCR trying out is beneficial for difficult-to-set up diagnoses for cutaneous (PCR check on pores and skin biopsy) or joint manifestations (PCR check on synovial fluid or synovial biopsy). It is but factor much less in sufferers imparting with neurological manifestations for greater than six weeks (bad sensitivity). Looking for *B. burgdorferi sensu lato* via way of means of PCR check in urine and blood samples isn't always recommended as research mentioned exceptionally contradictory outcomes.

#### Cardiac and Ocular Manifestations

The responsibility of a Lyme borreliosis in these types of attacks is difficult to prove. Nevertheless serology in serum is generally positive and antibodies are present at high titres.

### TREATMENT

The remedy is primarily based totally on antibiotic remedy. The energetic molecules utilized in medical exercise belong to 3 households of antibiotics:  $\beta$ -lactams, cyclins and macrolides, all of that have right in vitro hobby at the exclusive *Borrelia* species. The cutaneous and articular tissue diffusion of those three households of antibiotics is equivalent; in contrast, CSF diffusion of third-era injectable cephalosporins is higher than for different molecules. The desire of the molecule, its mode of management and the length of remedy rely upon the degree of evolution of the infection; healing hints were hooked up with the aid of using sort of medical manifestation. Doxycycline have to now no longer be utilized in kids beneath eight years of age, or in pregnant or lactating women.

#### Erythema Migrant

The remedy of a ME is primarily based totally at the management of antibiotics of the beta-lactam class (particularly amoxicillin) or cyclins (doxycycline) for 14 to 21 days. In the case of beta-lactam intolerance, doxycycline or azithromycin have to be favored. The symptoms and symptoms of the pores and skin cannot disappear till one month after the begin of remedy with none signal of a healing failure.

#### Joint Disorders

The remedy of arthritis is primarily based totally at the prescription of oral doxycycline or amoxicillin over a length of 30 days on average. The impact of

corticosteroid remedy stays poorly defined; it's been utilized in instances of insurrectionlion arthritis, in case of antimicrobial resistance. Sometimes used intra-articularly.

#### Late Stages of the Disease

The first line remedy of neuroborreliosis is ceftriaxone for 21 to twenty-eight days, oral remedy is suggested simplest in instances of remoted facial paralysis.

#### Monitoring

The excellent follow-up is primarily based totally at the evolution of the medical symptomatology and its whole resolution. A partial development has to contain as a minimum options: an antibiotic whose mode of movement might be exclusive from the primary antibiotic used or a recontamination. A new antibiotic remedy need to be proposed. The serological follow-up of the handled sufferers is most customarily vain in view of the reality that a serological scar persists most customarily. The affected person needs to be knowledgeable of the chance of recurrence in case of recent tick bites.

### PREVENTION

#### Primary Prevention

Is essential, carrying pants and long-sleeved shirts is preferable; in addition, clean apparel will permit higher identity of ticks for the duration of recurring inspection. This inspection may also encompass the pores and skin and the scalp, everyday exam of the integuments with reference to the chew withinside the following weeks to institute early a healing remedy in case of look of a ME. Repellents have constrained efficacy and in particular touch toxicity.

#### Secondary Prevention

In case of sting, the tick need to be eliminated as quickly as viable related to neighborhood pores and skin disinfection and easy medical tracking of the stung location for a month looking for similarly improvement of a likely MS are sufficient. Ether, alcohol or some other chemical are truly now no longer endorsed to extract the tick due to the fact those merchandise boom the hazard of regurgitation of the tick. The perfect is to apply a tick (tick-tick) forceps. Careful disinfection of the wound with an antiseptic answer is essential. The web page of the chew ought to be monitored for seven to 20 days after the chew. Only one have a look at confirmed the gain of

single-dose antibiotic remedy with two hundred mg once-day by day doxycycline inside seventy two hours of a tick chew in a virus location. This prevention is used best on a case-by- case basis, best in endemic areas, and if the tick has remained at the situation for greater than forty eight hours. It may be considered: if the length of attachment of the tick is more than forty eight-seventy two hours; if the length of implantation of the tick is unknown however the parasite is gorged with blood on the time of withdrawal; in pregnant ladies and youngsters beneath eight years of age, in particular if the stings are more than one and the length of attachment exceeds forty eight hours and in immunocompromised patients.

### STRENGTHS

The diagnosis of Lyme Borreliosis should be evoked on clinical manifestations 382 associated with a possible tick bite, recalling that specific anti-SR immunity does not prevent re-infection

EM is less common in Europe than in North America, neurological manifestations are more common in Europe and joint involvement in North America, probably due to genomic differences in spirochete Neurological forms (meningoradiculitis) are early and common in Europe

Lyme arthritis, later, usually presents as a recurrent oligoarthritis or monoarthritis (knee)

The biological diagnosis is based mainly on the serology, ELISA then western blot of confirmation

It is important to remember the importance of bacteriological evidence, direct examination at the joint or skin level

The presence of specific antibodies in the CSF cannot be sufficient for diagnosis in 395 case of neurological manifestations, because of the possible passive transfer of these 396 antibodies. The European criteria therefore recommend the proof of an intrathecal synthesis of this specific IgGs.

Therapeutic proposals are based on the very good sensitivity of spirochetes to beta-lactams, cyclins and macrolides, as well as to the clinical determination of the disease, giving priority to third-generation parenteral cephalosporins in case of neuroborreliosis Antibiotic treatment of EM ensures healing and prevents the occurrence of late manifestations

The pathogenesis of chronic arthritis remains uncertain and their treatment poorly codified

Prevention is based mainly on systematic research and immediate removal of the tick 406 after the activities exposed. It will avoid many prescriptions of antibiotics, useless and not innocuous

The systematic serological control of the treated patients is not based on any scientific reasoning since a well-conducted antibiotic treatment allows the complete eradication of *Borrelia* and avoids progression to late forms.

#### CONCLUSION

The gift look at confirmed that Quebec's GPs aren't acquainted with early LD scientific symptoms and symptoms and feature tendency to verify the scientific analysis with the aid of using serologic checking out while this isn't always recommended. Moreover, a few GPs request serological exams for bitten sufferers despite the fact that no scientific signal changed into manifested.

The majority of prophylactic remedies have been now no longer justified in particular due to the fact the eliminated tick hadn't been connected to the affected person lengthy sufficient to transmit the causative agent of LD and additionally due to the fact maximum of the ticks have been received in regions in which the superiority of *B. burgdorferi* changed into decrease than 20%.

However, the look at confirmed suitable practices concerning the form of antibiotic used for remedy of LD instances and analysis of more than one cutaneous manifestations. Lyme disorder is a public fitness subject that calls for a multidisciplinary method to lessen an boom in human prevalence and to restrict its effect in inflamed sufferers.

It ought to be referred to that for GPs to stick to contemporary hints calls for that know-how of the ecology of transmission cycles (specially contamination occurrence in ticks) is communicated to GPs and that the latter are educated to perceive the species of the tick and its engorgement state. Our look at indicates that public fitness government want to goal front-line fitness specialists with schooling on LD and on evidence-primarily based totally hints for the control of uncovered sufferers to keep away from overuse of public fitness sources and for the advantage of the fitness of the population.

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