Comparing Hospital Course in Hospitalized Patients Infected with Babesiosis Versus Patients Coinfected with Lyme Disease and Babesiosis

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Introduction:

Borrelia burgdorferi, the causative agent of Lyme Disease (LD), is a well-known tick-borne infectious agent that has been increasing in incidence over the last few decades[1]. *Babesia microti* is a parasite carried by the *Ixodes scapularis* tick, the same tick that carries *Borrelia burgdorferi*. Research is currently lacking on the interplay between babesiosis and LD and how coinfection of these diseases may present with more severe symptoms. We aimed to characterize the comorbidities of patients that are hospitalized with babesiosis and patients with coinfection, as well as the effect of coinfection on clinical course.

Methods:

A retrospective review of all adult patients diagnosed with babesiosis and tested for LD at Stony Brook University Hospital between 2014 and 2019 was performed (n=40). Patients with single babesia infection (Group 1, n=22) were compared to those with Babesia and LD (Group 2, n=18). Babesiosis diagnosis was determined by microscopic visualization of Babesia spp under peripheral blood smear and confirmed by PCR for B. microti. LD infection criteria included a positive screened ELISA test for Lyme followed by positive IgM antibody by western blot per CDC criteria (2-3 positive bands). Infection with only babesia was identified and compared to those with babesia plus coinfection with LD. Distribution mapping of cases was performed using ArcGIS 10.7 and ArcMap 10.7. Statistical analysis of the data used Fisher exact test, Chi-square, independent t-test, and Wilcoxon rank sum tests. Statistical significance was considered as a p-value <0.05.

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References: [1]Cardenas-de la Garza JA, De la Cruz-Valadez E, Ocampo-Candiani J, Welsh O. Clinical spectrum of Lyme disease. *Eur J Clin Microbiol Infect Dis.* 2019;38(2):201-208. doi:10.1007/s10096-018-3417-1

Figure 1. Single Infection Cases (Babesia Only) by Zip Code

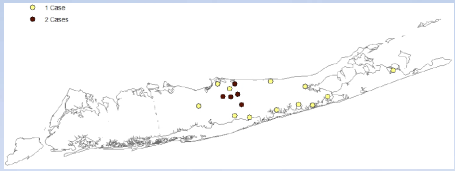

Figure 2. Co-Infection Cases (Babesia and LD) by Zip Code

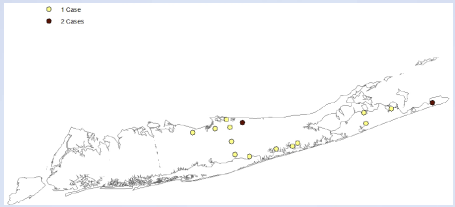

Table 1. Demographics and Biomarkers of single infection and coinfection

Variable	Babesia alone (N=22)	Babesia and Lyme (N=18)	P-Value
Age	62.9 (15.0)	63.3 (15.1)	0.86
Male Gender	16 (72.73)	14 (77.78)	1.0
Race			
White/ Caucasian	14 (70.0)	11 (61.11)	0.77
Hispanic	4 (20.0)	5 (27.78)	
Asian	1 (5.0)	0 (0.0)	
Other	1 (5.0)	2 (11.11)	
Admitted to Hospital	19 (86.36)	18 (100.0)	0.23
Length of Stay in days	3.0 (2.0)	5.5 (5.0)	0.03
ICU Admission	4 (18.18)	4 (22.22)	1.0
Hypertension	4 (30.77)	5 (35.71)	1.0
Diabetes	3 (23.08)	2 (16.67)	1.0
Heart Conditions	7 (46.67)	7 (43.75)	1.0
COPD/Asthma	2 (16.67)	5 (38.46)	0.38
Immunocompromised	2 (15.38)	3 (21.43)	1.0
Hb Categorized Abnormal	19 (83.36)	17 (94.44)	0.61
WBC (K/uL) Median (IQR)	5.6 (3.6)	6.1 (2.5)	0.65
ALT (U/L) Median (IQR)	42.5 (31.0)	36.0 (29.0)	0.64
AST (U/L) Median (IQR)	47.5 (46.0)	46.5 (41.0)	0.41
T-bilil (mg/dL) Median (IQR)	1.6 (0.90)	1.3 (1.6)	0.75
LDH (IU/L) Median (IQR)	690.0 (522.5)	466.5 (350.0)	0.96
Haptoglobin (g/L) Median (IQR)	8.0 (0.70)	7.4 (0.60)	0.51
ESR (mm/hr) Median (IQR)	40.5 (53.0)	22.5 (45.4)	0.82
CRP (mg/L) Median (IQR)	12.4 (0.0)	5.1 (9.2)	0.72
Procalcitonin (ng/mL) Median (IQR)	1.6 (1.6)	1.2 (1.1)	0.77
Parasitemia at Admiss Median (IQR)	1.0 (1.6)	1.7 (4.1)	0.14

Results:

A total of 40 patients were tested for both babesiosis and LD. There were 22 (55%) patients with babesia alone (Group 1) and 18 (45%) patients with babesia and LD included in this analysis (Group 2). Both groups were similar in gender, race, and age, and comorbidities including hypertension, diabetes, heart conditions, COPD/asthma, and immunocompromised state (p>0.05). The maximum parasitemia (Group 1: 1.1%, Group 2: 1.7%, p=0.26) and percentage admitted to the ICU (Group 1: 18.18%, Group 2: 22.22%, p=1.0) were similar among groups. While lab values on admission including WBC, hemoglobin, platelets, LDH, ALT, and AST did not significantly differ (p>0.09), the length of hospital stay in Group 2 was significantly longer than Group 1 (Group 1: 3.0 days, Group 2: 5.5 days; p=0.03). There were no patient mortalities in either group (Table 1). The Long Island, NY distribution pattern in geographic location of coinfection cases versus single infection cases had no specific pattern (Figures 1 and 2).

Discussion:

Patients with babesiosis alone or babesiosis plus LD coinfection are similarly infected populations with respect to demographics, underlying comorbidities, and admission lab values. Infection with babesiosis plus LD coinfection had a longer hospital stay compared with infection with babesiosis alone. This suggests that having a coinfection of babesiosis and LD may lead to a more severe illness than a single infection with babesiosis. Further research is needed to investigate the underlying mechanisms by which this occurs. We suggest considering babesiosis in patients with LD in endemic areas.

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