Clinical Spectrum of Powassan Virus Infection in Patients Presenting with Suspected Acute Tick-borne Illness from a Lyme-endemic Focus in the Midwest

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ABSTRACT - Revised

Background: Powassan virus (POWV) is the North American member of the tick-borne encephalitis complex of viruses. The potential for concurrent transmission with other tick-borne pathogens, particularly the Lyme disease agent Borrelia burgdorferi, is under studied. To better understand the clinical spectrum of POWV infection patient health records were reviewed and laboratory studies performed to evaluate the frequency of tick-borne pathogen exposure in patients presenting with suspected acute tick-borne illness (TBI) from a Lyme-endemic focus in the Midwest.

Methods: 135 samples selected from patients seen at Gunderson Health System presenting during 2016 with Lyme-like symptoms were tested for Anaplasmosis, Babesiosis, Lyme disease and POWV. PCR testing was performed for Anaplasma and Babesia. Serologic testing for B. burgdorferi was performed using two-tier serologic testing. POWV infection was confirmed by POWV-EIA/FIA (Coppe Laboratories). IRB approval was obtained.

Results: Anaplasma infection was seen in 44/88 (50%), Babesia infection in 5/67 (7.5%), Lyme disease in 45/135 (33.3%) and POWV infection in 16/132 (12.2%) patients. Co-infections were seen in 21/135 (15.5%) patients. Patients with Babesia more often presented with anemia, myalgia and decreased appetite. Patients with Anaplasma presented with fever, chills/sweats, nausea/vomiting, rash, elevated liver function tests, thrombocytopenia, leukopenia, and remembered the tick exposure. Lyme disease patients complained of fatigue, rash, chills/sweats, headache and remembered the tick exposure. Co-infection with both Lyme and Powassan virus was seen in 10/45 (23%) of patients. Patients with Lyme, Powassan virus or co-infection had no other significant difference in symptoms.

Conclusions: POWV infection is more prevalent in the Midwest than previously appreciated. Clinical data suggests that symptoms of POWV infection may be indistinguishable from those of Lyme disease, requiring laboratory testing for proper TBD diagnosis and avoidance of unnecessary antibiotic use. The high rate of POWV co-occurrence with Lyme disease may have relevance for patient outcomes and warrants further investigation.

BACKGROUND

Powassan virus (POWV) is an encephalitis complex of viruses transmitted by the black-legged tick, Ixodes scapularis. POWV and the closely related Western Equine Encephalitis (WEE) virus are transmitted in the western and northeastern United States, respectively. POWV is related to the Japanese encephalitis virus. POWV is endemic in the northwestern United States, including parts of Minnesota, Wisconsin, and Michigan. POWV is known to have several animal reservoirs, including white-tailed deer, snowshoe hares, and foxes.

METHODS

To better understand the clinical spectrum of POWV infection, patient health records were reviewed and laboratory studies performed to evaluate the frequency of tick-borne pathogen exposure in patients presenting with suspected acute tick-borne illness (TBI) from a Lyme-endemic focus in the Midwest. 135 samples selected from patients seen at Gunderson Health System presenting during 2016 with Lyme-like symptoms were tested for Anaplasmosis, Babesiosis, Lyme disease, and POWV. PCR testing was performed for Anaplasma and Babesia. Serologic testing for B. burgdorferi was performed using two-tier serologic testing. POWV infection was confirmed by POWV-EIA/FIA (Coppe Laboratories). IRB approval was obtained.

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CONCLUSIONS

Powassan virus infection is more prevalent in the Midwest than previously appreciated. Clinical data suggests that symptoms of POWV infection may be indistinguishable from those of Lyme disease, requiring laboratory testing for proper TBD diagnosis and avoidance of unnecessary antibiotic use. The high rate of POWV co-occurrence with Lyme disease may have relevance for patient outcomes and warrants further investigation.