Introduction:
We report a case of a patient with acute renal failure in Lyme disease-associated focal proliferative mesangial nephropathy. Lyme disease is a vector-borne disease caused by Borrelia burgdorferi, transmitted by the bite of an infected ixodes tick. Post-infectious glomerulonephritis (GN) secondary to Borrelia burgdorferi infection in man could be fatal, as it is in canine Lyme borreliosis.

Case:
A 61-year old man with chronic ethanolic hepatitis was admitted to a provincial hospital, complaining of nausea, diarrhoea and loss of his sense of taste. A few days prior hospitalization, he had been bitten by a tick. He developed erythema gyratum repens in the right leg, thorax and face. Kidney function was altered despite normal urine flow: creatinine 5.04 mg/dl and BUN 126 mg/dl. Urinalysis showed light proteinuria and microscopic hematuria. IgG and IgM antibodies to Borrelia burgdorferi were detected by ELISA and Western blot confirmed the diagnosis. Renal biopsy showed mild mesangial proliferation and mesangial and paramesangial deposits on AFOG stain. A diagnosis of acute renal failure in Lyme disease-associated focal proliferative IgA nephropathy was made. Intravenous antibiotic medication was started (ceftriaxone 1 gram daily i.v.). The patient was later discharged, serum creatinine had decreased to 3.5 mg/dl with a BUN of 58 mg/dl, and a slight improvement was observed on follow-up.

Conclusion:
Borrelia burgdorferi is a possible cause of post-infectious GN in humans as it is in dogs. Difficulties in identifying Borrelia burgdorferi may also be one of the reasons for the paucity of reports on the association of this infection with glomerulonephritis in humans. Currently, various types of histological renal lesions have been reported.

Implication for health policy/practice/research/medical education:
The diagnosis of Lyme disease is based primarily on clinical history and on the presence of antibodies (IgM an IgG) to Borrelia burgdorferi. This vector-borne disease is a possible cause of post-infectious glomerulonephritis (GN) in humans as it is in dogs. It is likely that the immune-complex plays a role in the pathogenesis of this disorder, but acute Lyme disease may also contribute to the development of activation of previously immune-mediated glomerular disease.

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Introduction
Lyme disease is the most common vector-borne disease in the United States, and several species of the genus ixodes are implicated in most European cases. The causative spirochete, Borrelia burgdorferi, is transmitted by the bite of an infected ixodes tick. If left untreated the infection may lead to localized arthritis, disorders of the nervous system and even cardiac arrest. The spirochete is known to induce glomerulonephritis in animals, as has been reported in dogs (1,2). Lyme nephritis secondary to Borrelia burgdorferi infection in man could be fatal, as it is in canine Lyme borreliosis (3). To date, post-infectious glomerulonephritis (GN) associated with Lyme disease in humans has been reported four times in the literature (4-7). We report a case of a patient with acute renal failure secondary to focal proliferative IgA nephropathy, who had serologically-confirmed Lyme disease and was treated accordingly (8). It is likely that the immune-complex plays a role in the pathogenesis of this disorder, but acute Lyme disease may also contribute to the development of activation of previously immune-mediated glomerular disease.

Case Presentation
A 61-year old man with chronic ethanolic hepatitis associated with a history of alcohol abuse was admitted to a provincial
hospital in May 2009, complaining of nausea, diarrhoea and loss of his sense of taste. A few days prior to being hospitalized, he had been bitten by a tick while working in the woods. He soon developed erythema gyratum repens in the right leg, thorax and face. He also suffered joint pain in his knees, ankles and elbows. No fever or headaches were reported. At admission he suffered from asthenia, weariness and dizziness. Physical examination revealed light hypertension (150/85 mmHg), no rash, but showed per-tibial oedema. Laboratory tests revealed an increase in erythrocyte sedimentation rate (ESR) 72 mm/h and C reactive protein (CRP) 3.2 mg/dl (N<0.5). White blood cell count was 15.42 x1000/μL, platelets were 125 x1000/μL and hemoglobin levels were 9.9 g/dl. Hepatic and pancreatic lab tests were abnormal, with gamma-GT values of 361 UI (N 8-60), alkaline phosphatase levels of 195 (N 40-129) and amylase levels of 200 UI (N 8-100). Kidney function was altered despite normal urine flow; creatinine 5.04 mg/dl and blood urea nitrogen (BUN) 126 mg/dl. Severe metabolic acidosis was observed; pH 7.26, HCO₃⁻ 6.7 mmol/L, BE -17.5 mmo/L associated with hyperkalemia (6.4 mEq/l). Urinalysis showed normal density and acidity (1011 and pH 5, respectively) and microscopic hematuria. Circulating immune complexes level was slightly increased (6.5 micg/ml, N 0-3). IgG and IgM antibodies to Borrelia burgdorferi were detected by ELISA at levels of 33 U/ml (N 0-5 U/ml) and 0.210 U/ml (index 0-0.199), respectively. Western blot confirmed IgG 44 U.A. (positive score >7) and IgM 13 U.A. (positive score >7) and was interpreted as indicating present or past Lyme disease.

Renal biopsy was performed. Light microscopy examination showed mesangial expansion and focal mesangial proliferation on 16 glomerular bodies (Figures 1 and 2), with several mesangial and paramesangial deposits on Acid Fuchsin Orange G (AFOG) stain (Figure 3). No lesions were detected at the tubular level or in the interstitial tissue. In immunofluorescence (IF) study, granular diffuse mesangial positivity for IgA and C3 (≥ in a scale of 0-3) (Figure 4) was observed. A diagnosis of acute renal failure in Lyme disease-associated focal proliferative IgA nephropathy was made. Biopsy was classified as M₁E₀S₀T₁ (7).

The patient was later discharged, serum creatinine had decreased to 3.5 mg/dl with a BUN of 58 mg/dl, and a slight improvement was observed on follow-up.

**Discussion**

The diagnosis of Lyme disease is based primarily on clinical history and on the presence of antibodies (IgM an IgG) to

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**Table 1. Laboratory tests (at presentation)**

| Parameters                      | Values   |
|---------------------------------|----------|
| Haematocrit (%)                 | 30       |
| Haemoglobin (g/dl)              | 9.9      |
| White blood cell count (x10⁹)   | 15.4     |
| Platelets (x1000)               | 125      |
| Fibrinogen (mg/dl)              | 405      |
| Prothrombin time (sec)          | 11       |
| Thromboplastin partial time (sec)| 34     |
| Serum creatinine (mg/dl)        | 5.04     |
| Blood urea nitrogen (mg/dl)     | 126      |
| Aspartate aminotransferase (IU) | 42       |
| Alanine aminotransferase (IU)   | 83       |
| Erythrocyte sedimentation rate (mm/h)| 72   |
| C-reactive protein (mg/L)       | 32       |

**Bacterial Infection Markers**

| Borrelia burgdorferi IgG    | ELISA (U/ml) | 33 |
| ELISA Western blotting      | p10016, VisE8 p39 16 |
| Borrelia burgdorferi IgM    | ELISA Index  | 0.210 |
| ELISA Western blotting      | visE6, p396, p41/l1 |

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**Figure 1 (A & B).** LM: mesangial expansion and mild mesangial proliferation of glomerular tuft (PAS x400)
Glomerulonephritis in Lyme disease

Figure 2. LM: mesangial expansion and global hypercellularity (Masson-Goldner trichrome x400)

Figure 3. LM: mesangial and paramesangial deposits [AFOG stain x400]

Figure 4. I.F. Granular, diffuse mesangial positivity for C3 (3+ in a scale of 0-3)

Borrelia burgdorferi. False-positive results have been reported in several infectious diseases such as infectious endocarditis, mononucleosis, CMV infection and other spirochetal diseases such as syphilis and periodontal disease. It has been suggested that the combination of ELISA to detect IgM and IgG anti-B. burgdorferi antibodies and Western blot to confirm the questionable ELISA provides the greatest sensitivity and specificity for the laboratory diagnosis of Lyme disease. In 2 of the previously reported cases of Lyme-related membranoproliferative glomerulonephritis (MPGN) in humans, an immune-complex related pathogenesis was hypothesised (5,7). In favour of this hypothesis, circulating immune-complexes were detected. In our patient, however, it is possible that Lyme infection could have led to activation of a previous quiescent glomerulopathy. It appears likely that our patient had underlying IgA nephropathy at baseline (chronic ethanolic hepatitis with polyclonal increase of IgA). The temporal relationship between Lyme infection and acute renal failure raises the probability that the flare was produced by an activation of the immune response.

Our patient’s outcome is fairly satisfactory. He was never placed on renal replacement therapy, as was the case of another patient reported elsewhere (5) and he regained most of his baseline renal function. Renal function improved following treatment for B. burgdorferi infection and owing to the rapid improvement in renal function. Administration of immunoglobulins and corticosteroids was not necessary.

Conclusion
Borrelia burgdorferi is a possible cause of post-infectious GN in humans as it is in dogs. Difficulties in identifying Borrelia burgdorferi may also be one of the reasons for the paucity of reports on the association of this infection with glomerulonephritis in humans. Currently, various types of histological renal lesions have been reported. In summary, the clinical course as well as the final outcome of affected patients may vary depending on the severity of renal lesions detected at kidney biopsy.

Authors’ contributions
LT made diagnosis of Lyme disease-associated focal proliferative IgA nephropathy, CN, AF, PL have contributed to the development of case report and Rolla D revised the manuscript.

Conflict of interests
The authors have no conflicts of interest to declare.

Ethical considerations
Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the author.

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References
1. Dambach DM, Smith CA, Lewis M, Van Winkle TJ. Morphological, immunoistochemical, and ultrastructural characterization of a distinctive renal lesion in dogs putatively associated to Borrelia burgdorferi infection: 49 cases (1987-1992). Vet Pathol 1997; 34: 85-96.
2. Emery C, McCabe. A suspected case of Lyme Glomerulonephritis in a Labrador Retriever. Cornell University College of Veterinary Medicine November 13, 2002.
3. Grauer GF, Burgess EC, Cooley AJ, Hagee JH. Renal lesions associated with Borrelia burgdorferi infection in a dog. J Am Vet Med Assoc 1988; 193: 237-39.
4. Kelly B, Finnegan P, Cormican M, Callaghan J. Lyme Disease and Glomerulonephritis. *Ir Med J* 1999; 92: 372-73.

5. Kirmizis D, Efstratiadis G, Economidou D, Diza-Mataftsi E, Leontsini M, Memmos D. MPGN secondary to Lyme Disease. *Am J Kidney Dis* 2004; 43: 554-51.

6. Zachaus M. Mesangioproliferative IgA-nephritis in a patient with Lyme borreliosis. *MMW Fortschr Med* 2008; 150:38-48.

7. Mc Causland FR, Niedermaier S, Bijol V, Rennke HG, Choi ME, Forman JP. Lyme disease-associated glomerulonephritis. *Nephrol Dial Transplant* 2011;9:3054-6.

8. Magnarelli LA, Ijido JW, Padula SJ, Flavel RA, Fikrig E. Serological diagnosis of Lyme borreliosis by using enzyme-linked assays with recombinant antigens. *J Clin Microbiol* 2000;1735-39.

9. Herzenberg AM, Fogo AB, Heather NR, Troyanov S, Bavbek N, Massat AE, et al. Validation of the Oxford classification of IgA nephropathy. *Kidney Int* 2011;80:310-7.