Renal damage associated with canine leishmaniasis induces nephritis and glomerulonephritis which cannot always be detected using classical laboratorial biomarkers (creatinine, urea, protein/creatinine ratio and urine specific gravity). N-acetyl-β-D-glucosaminidase (NAG) and glutamyl https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/transferases (GGT) are hydrolytic enzymes found in the epithelial cells of the proximal tubule of the kidney being their presence in the urine associated to tubular damage. Hence, we aimed to evaluate the diagnostic power of urinary NAG and GGT as early markers of renal disease in dogs affected with leishmaniasis using a modified IRIS chronic kidney disease staging.

A prospective study was conducted in 5 groups of dogs:17 healthy dogs (C),13 dogs (G1) with an urinary protein/creatinine ratio (UP/C) ≤0.2 and plasma creatinine (CR) <1.4 mg/dL, 5 dogs (G2) with UP/C between 0.21-0.4 and CR < 1.4 mg/dL, 6 dogs (G3) with UP/C ≥ 0.41 and CR <1.4 mg/dL and 15 dogs (G4) with UP/C ≥ 0.41 and CR≥1.4 mg/dL.

Dogs presented to the University of Extremadura small animal hospital with a variety of clinical signs and diagnosed with visceral Leishmaniasis were included in the study. All dogs had haematology, biochemistry, blood protein electrophoresis, Leishmania ELISA (quantititative), abdominal ultrasonography, and full urine analysis and culture (including UP/C, NAG and GGT) carried out.

NAG was determined using a commercial kit (Diazyme®, Germany), GGT by a specific kit from RAL® (Spain). The results are all normalized to their respective urinary creatinine and expressed as ratios: uNAG/CR and uGGT/CR. All groups were not normally distributed and a Mann-Whitney-*U* test was used to compare among groups; $P < 0.05$ was considered statistically significant.

The urinary uNAG/CR (IU/g; mean ± SD) was 1.6 ± 0.7 in group C;5.77 ± 5.04 for G1;10.27 ± 6.96 in G2;12.61 ± 13.1 in G3 and 57.51 ± 54.36 in G4. For uGGT/CR (IU/g; mean ± SD) the values obtained were 0.8 ± 0.69 for group C;1.43 ± 1.58 in G1;5.07 ± 10 in G2;3.34 ± 5.72 in G3 and 17.75 ± 31.22.1 in G4.

uNAG/CR differed statistically in all groups compared to control and G1, G2 and G3 differed from G4; significant differences for uGGT/CR were only found between C and G4.

This study shows that uNAGC/CR appears to be a good biomarker for early detection of renal tubular damage at early stages of canine leishmaniasis, prior to the presence of azotaemia and proteinuria. On the contrary, uGGT/CR appears to be less useful for this purpose, as it is only consistently elevated at more advanced stages of leishmania-associated chronic kidney disease.

Disclosures

No disclosures to report.

ESVNU-P-13

Usefulness of urine neutrophil gelatinase-associated lipocalin (NGAL) and Cystatin C (CysC) in the diagnosis of renal disease in dogs affected with leishmaniasis

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Canine leishmaniasis is a highly prevalent zoonotic disease in Spain. All dogs affected present structural and/or functional abnormalities in their kidneys ranging the clinical presentation from asymptomatic to severely diseased individuals being the clinical signs, creatine and proteinuria used to assess the evolution of their condition. Evaluation of other markers of early renal damage could be used for redefining disease classification or for prognostic and/or therapeutic guidance purposes. Moreover, dogs with Leishmaniasis are optimal natural models for the study of tubular damage biomarkers such as NGAL and CysC in canine chronic kidney disease. We aimed to evaluate the diagnostic power of urinary NGAL and CysC as early markers of renal disease in dogs diagnosed with *L. infantum* using a modified IRIS chronic kidney disease staging.

Dogs presented to the University of Extremadura veterinary hospital with a variety of clinical signs and diagnosed with visceral Leishmaniasis were included in the study and 5 groups were stablished: 10 healthy dogs (C),13 dogs with an urinary protein/creatinine ratio or UP/C ≤ 0.2 and plasma creatinine or CR < 1.4 mg/dL (G1),7 dogs presenting UP/C 0.21-0.4 and CR < 1.4 mg/dL (G2),16 dogs with UP/C ≥ 0.41 and CR < 1.4 mg/dL (G3) and 16 dogs with UP/C ≥ 0.41 and CR≥1.4 mg/dL (G4).Some dogs also had other testing including thoracic radiographs, echocardiography or Leishmania PCR in a variety of tissues.

NGAL was determined using the canine NGAL Elisa kit (Abcam, USA) and the results are expressed as NGAL/creatinine ratio (uNGAL/CR). Cystatin C was measured using a turbidimetric latex assay (Spinreact, Spain) and is expressed as CysC/creatinine ratio (uCysC/CR). Mann-Whitney-*U* test was used to run all comparisons due to the non-gaussian distribution of the data with $P < 0.05$ considered as statistically significant.

The urinary uNGAL/CR (μg/g; mean ± SD) was 1082 ± 782 in group C;5210 ± 3676 for G1;38 446 ± 12 269 in G2;453 219 ± 322 898 for G3 and 4 306 983 ± 3 852 666 in G4. For uCysC/CR (μg/g; mean ± SD) the values obtained were 80 ± 54 in C; 485 ± 249 in G1; 475 ± 81 in G2; 9294 ± 7992 in G3 and 36 450 ± 22 571 in G4. For both biomarkers statistically significant differences were found between the control group and all the rest. G1 and G2 were significantly different compared to G3 and G4 for NGAL and CysC. Additionally, CysC values differed significantly between G3 and G4.

Our results demonstrate that urinary uCysC/CR and uNGAL/CR are highly sensitive biomarkers that detect tubular damage in non-azoemic, non-proteinuric dogs affected with canine leishmaniasis.

Disclosures

No disclosures to report.

ESVNU-P-14

Complicated UTI in dogs: uropathogens, antimicrobial resistance and comorbidity

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Complicated urinary tract infections (cUTI) occur in the setting of a urinary tract with underlying metabolic, functional, or structural abnormalities that typically require longer antibiotic courses and carry a higher risk of treatment failure.

UTI are major reasons for antibiotic prescription in dogs and the responsible bacterial populations have developed increasing resistances.

The aim of this retrospective study was to investigate the prevalence of pathogens, their susceptibility patterns, the comorbidities and the urinary sites involved (detected by ultrasonography) in a population of dogs affected with cUTI.

Four hundred thirty one urine samples collected by cystocentesis from 260 dogs underwent to urine culture for diagnostic purposes. Antimicrobial sensitivity tests were obtained by Kirby-Bauer method. Comorbidities were deduced by the analysis of patient clinical and ultrasound reports.

A control group of 360 dogs (4fold the dogs affected) was randomized among the whole canine population examined during the same period of time (2013-2017). Wilcoxon, Kruskal-Wallis and Chi-square tests were used for statistical analysis.

One hundred forty one urine samples (32.7%) from 90 dogs (34.6%) had a positive culture.

Crossbreeds (29%) and spayed females (42%) were prevalent and the mean age was 9.2 years.

A significant higher prevalence, among the "UTI-dogs" was observed for Labrador Retriever, English Bulldog, Golden Retriever, Beagle and Cocker Spaniel, spayed females and dogs between 8 and 13 years old.

Escherichia coli was the predominant pathogen (43%), followed by *Staphylococcus pseudintermedius* (8%), *Staphylococcus aureus* (8%), *Streptococcus faecalis* (7%), *Klebsiella pneumoniae* (6%), *Pseudomonas aeruginosa* (5%) and other 13 species. A predominance of single isolates (89.4%) compared to polymicrobial infections (10.6%) was observed.

Marbofloxacin was overall the most effective molecule (63.1% sensitivity), followed by Cefovecin (58.6%), Ceftriaxone (55.1%), Enrofloxacin (54%) and Pradofloxacin (53.3%). *Escherichia coli* showed the highest sensibility versus Cefovecin (70%), Marbofloxacin (67.2%), Trimetoprim/Sulphamide (64.3%), Ceftriaxone (63.5%), Pradofloxacin (61.5%) and Enrofloxacin (60.9%).

The most represented identified comorbidities were urolithiasis (25%), CKD (24%), hyperadrenocorticism (11%) and extra-urinary neoplasms (10%). Eight dogs were included because of the recurrence of the infections.

Of the 68 dogs underwent to abdominal ultrasound, 58 (85.3%) showed ultrasonographic abnormalities involving the urinary system: 36 (52.9%) in the upper tract, 41 (60.3%) in the lower tract and 19 of these in both (27.9%).

The high rate of antimicrobial resistance detected could lead to treatment failures and poor prognosis; additional guidelines are needed because of the public health concern determined by the zoonotic potential of the isolated bacteria.

Disclosures

No disclosures to report.

ESVNU-P-15

Cats at risk or with spontaneous CKD. What affects survival and prognosis?

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Chronic kidney disease (CKD) is among the major causes of morbidity and mortality in cats, with a significant prevalence up to 31% over 15 years old.

The aim of this retrospective observational study was to evaluate the prevalence of death, survival time and risk factors in a population of cats at risk or affected with CKD.

One hundred thirty three cats, from a starting population of 472 (years 2013-2018), were included in this study. One or more of the following criteria had to be observed during their first clinical examination: age over 9 years, serum creatinine (SCr) >1.6 mg/dL, borderline (0,2-0,4) or pathologic (>0,4) urinary protein/creatinine ratio (UPC), urine specific gravity (USG) <1.035. Furthermore, their "follow-up data" have been obtained through an online questionnaire filled by the owners (beginning of 2019). The nephropathic cats were staged according to IRIS guidelines, and not nephropathic cats were included in stage 0.

Wilcoxon test and Kaplan Meyer survival curve analysis were performed.

Median age of the population was 11 $\pm$ 4,31 years; male were overrepresented (55 vs 45%); Domestic Shorthair was the predominant breed (76%).

Forty nine (36,8%) cats were included in stage 0; 21 (15,8%) in stage 1; 48 (36,1%) in stage 2; 7 (5,3%) in stage 3; 8 (6%) in stage 4, with a mean sCr value of 1,98 mg/dL $\pm$ 1,54.

Sixty (45,1%) cats were naturally dead or euthanized at the time of the survey; 25 (18,8%) of these due to CKD. Some parameters were significantly different between the two groups: "dead by CKD" and "dead by other diseases". Serum creatinine was higher, while USG, red blood cells (RBC), white blood cells (WBC) and hematocrit (Ht) were significantly lower in "dead by CKD" cats. Survival time in nephropathic cats was related with age, IRIS staging, serum phosphorus, RBC, WBC, Ht. Cats staged as IRIS-2 survived longer than cats staged as IRIS-1, because other comorbidities are the reason for the consultation in stage-1 cats. A lower survival time was observed in cats with a body condition score different than normal (higher or lower). Lower survival was observed in hypertensive conditions when the whole population of cats was considered, and not only the CKD one.

Other than sCr, results from CBC and USG are to keep in consideration in a prognostic evaluation of cats at risk or affected with CKD. Age has to be considered a risk and a prognostic factor.

Disclosures

No disclosures to report.