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Renal Cell Carcinoma in a Dog: Pathologic and Cytologic Findings

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SUMMARY

This study presents a dog with a history of anorexia, vomiting and abdominal distention of one week duration. Abdominal palpation revealed a mass in the right abdominal quadrant. Laboratory abnormalities included slight anaemia, leukocytosis, thrombocytosis, hypoalbuminaemia, hypokalaemia, hypocalcaemia and metabolic acidosis. Urine was reddish in color with 3+ protein and blood reaction, 2+ leukocyte, and 2+ glucose. Erythrocytes and leukocytes casts and innumerable renal and transitional epithelial were present. Ultrasonographic examination revealed a solitary mass taking the place of right kidney. Urine sediment cytology revealed large clusters of markedly pleomorphic cells. Mitotic figures in some cells were observed. A large tumour mass was found at laparotomy. The right kidney was replaced by this massive ball shaped tumour. Unilateral nephrectomy was performed and renal cell carcinoma was diagnosed by microscopic examination.

KEY-WORDS : Renal cell carcinoma - dog - urine cytology.

RÉSUMÉ

Carcinome rénal chez un chien : intérêts des examens cytologique et histologique. Par F. M. BIRDANE, F. HATIPOGLU, M. ORTATATLI, Y. KOC et K. TURGUT.

Cette étude développe le cas d'un chien présenté pour anorexie, vomissements et distension abdominale évoluant depuis une semaine. La palpation abdominale a permis d'identifier une masse dans le quadrant abdominal droit. Les examens de laboratoire ont révélé une anémie légère, une leucocytose, une thrombocytose, une hypoalbuminémie, une hypokaliémie, une hypocalcémie et une acidose métabolique. L'urine était rougeâtre avec 3+ de protéines et de plage péroxydasique, 2+ de leucocytes, et de glucose. Le culot a permis d'identifier des hématies, des cylindres leucocytaires et de nombreuses cellules rénales et urothéliales. A l'examen ultrasonographique, une masse unique a été vue dans la région où se situe le rein droit. La cytologie du sédiment urinaire a révélé la présence d'amas de cellules pléomorphes et de figures de mitoses. A la laparotomie, une masse de grande taille occupait la moitié de la cavité péritonéale à la place du rein. Une néphrectomie unilatérale a été effectuée. L'examen microscopique a permis de diagnostiquer un adénocarcinome rénal.

MOTS-CLÉS : Carcinome rénal - chien - cytologie urinaire.

Introduction

Primary renal neoplasms are uncommon in dogs and they are reported to be found to constitute only 0.3 to 1.7 % of all neoplasms in this species. Of these primary neoplasms, most are renal carcinomas [4]. Breed predisposition does not exist. Renal carcinoma develops more frequently in males. Most surveys indicate that dogs older than 3 to 5 years are under more risk of neoplasm development [4, 10]. Generally, renal carcinoma in dogs primarily metastasizes to the lung and lymph nodes [1, 4, 5].

The most common clinical signs of renal carcinoma in dogs are anorexia, weight loss, and palpable abdominal mass.

Fever, haematuria, thoracolumbar tenderness, and lameness or signs of bone-associated pain are sometimes observed [4, 5]. Laboratory tests may indicate anaemia, leukocytosis, haematuria, and occasionally uraemia [4, 6, 8]. Polycythaemia associated with the elaboration of erythropoietin by these tumours is observed occasionally in man [8]. Tumour cells may be present in the urine sediment. Diagnosis can be confirmed by needle biopsy [8].

Case history

An 8 years old 20 kg male Terrier dog was presented to the Clinic of Internal Medicine, Faculty of Veterinary Medicine,

University of Selcuk, for evaluation of anorexia and abdominal distention of one week duration. The dog had been fed a home made diet. Its vaccination status was current. Five days before referral, the dog had been treated by the referral veterinarian with amoxicilline (Amoklovine® , Deva, Turkey), simethicone (Metsil®, Bilim, Turkey) and liquid paraffin (Sokol®, Biofarma, Turkey) because of severe abdominal distention. However, abdominal distention and lethargia became more severe on the last three days. The dog had vomited twice at the day of referral.

PHYSICAL EXAMINATION AND INITIAL DIAGNOSTIC TESTS

On the admission, the dog had abdominal distress with an abdominal distension. The rectal temperature (39.1 °C), the heart rate (120 beats/min), the respiratory rate (24 breaths/min), the hydration status and mucous membranes were all normal. The dog was alert, but painful during abdominal palpation which revealed a mass in the right abdominal quadrant.

The haematology, serum biochemical analysis, blood gas analysis, urinalysis (sample obtained by cystocentesis) and faecal analysis were performed. Haematological abnormalities consisted of slight macrocytic and hypochromic anaemia, leukocytosis characterized by regenerative left shift, and thrombocytosis (Table I). Abnormal serum biochemical findings included hypoalbuminemia, hypokalemia and hypocalcemia (Table I). Blood gas analysis revealed metabolic acidosis (Table I). Urine sample was reddish in colour with specific gravity of 1,025. Urinalysis with dipstick included 3+

protein reaction, 2+ leukocytes, 3+ blood and 2+ glucose. To further evaluate the haematuria, microscopic examination of sediment was performed. Microscopic sediment revealed erythrocytes and leukocytes casts with numerous transitional epithelial and renal tubular epithelial cells (Table II). Parasites were not detected in the faeces.

To further evaluate the abdominal mass and urinalysis abnormalities, abdominal ultrasonography, urine cytology and bacteriologic culture of the urine specimen were performed.

Urinalysis	(Cystocentesis)
Appearance	Cloudy, reddish
Specific Gravity	1025
pH	5.5
Protein	3+
Glucose	2+
Ketones	Negative
Blood	3+
Bilirubin	Negative
Sediment	
WBC / hpf	TNTC
RBC / hpf	TNTC
Casts / hpf	Transitional epithelial's, RBC and WBC
Crystals / hpf	Negative
Bacteria	Negative

Abbreviations : (RBC: Red Blood Cells, WBC: White Blood Cells, TNTC: Too Numerous To Count)

TABLE II. — Results of the urinalysis of the dog

Haematology	Normal Values*	Serum Biochemistry	Normal Values*		
RBC x 10 ¹² / µL	5.45	5.4-7.8	ALT (U/L)	50	15-50
Hb (g/dL)	11.6	13-19	ALP (U/L)	95	10-73
PCV (%)	39.5	37-54	Total protein (g/dL)	5.8	5.4-7.1
MCV (um ³)	74.4	62-74	Albumin (g/dL)	1.3	2.5-3.6
MCHC (g/dL)	29.5	32-36	Globulin	4.5	2.3-5.2
Reticulocytes (%)	14.2	12-15	BUN (mg/dL)	20	7-25
RBC morphology	Normal		Creatinine (mg/dL)	1.15	0.5-1.4
WBC x 10 ³ /mm ³	21.8	6-17	Glucose (mg/dL)	78	77-120
Band neutrophils x 10 ³ /mm ³	0.40	0-0.3	Acetone (U/L)	1815	510-1854
Segmented neutrophils x 10 ³ /mm ³	18.2	9-11.5	Lipase (U/L)	225	13-200
Lymphocytes x 10 ³ /mm ³	2.5	1-4.8	Sodium (mEq/L)	148	141-153
Monocytes x 10 ³ /mm ³	0.38	0.1-1.4	Potassium (mEq/L)	3.09	3.7-5.8
Eosinophils x 10 ³ /mm ³	0.19	0.1-1.25	Calcium(mg/dL)	4.5	5.6-11.2
Basophils x 10 ³ /mm ³	0.09	< 0.1	Corrected calcium (mg/dL)	6.7	
Platelets x 10 ³ /mm ³	597	175-500	Blood gas analysis		
Toxic neutrophils	None		pH	7.31	7.39
			PCO ₂	32.3	34.8
			PO ₂	34.4	>40
			HCO ₃	16.9	22
			BE	-8.6	-3-3

Normal Values* : Reference values are from : "Veterinary Laboratory Medicine, Interpretation and Diagnosis", Second Ed., Editors : Meyer, DU and Harvey JW, WB Saunders Company, USA, 1998.

Abbreviations : (RBC: Red Blood Cells, Hb: Hemoglobin, PCV: Packed Cell Volume, MCV: Mean Corpuscular Volume, MCHC: Mean Corpuscular Hemoglobin Concentration, WBC: White Blood Cells, ALT: Alanine Transaminase, ALP: Alkaline Phosphatase, BUN: Blood Urea Nitrogen, BE: Base Excess)

TABLE I. — Laboratory findings in the dog [7].

Results of investigations

1) ULTRASONOGRAPHIC FINDINGS

Abdominal ultrasonographic examinations were performed with the patient in dorsal recumbency. The bladder, prostate, spleen, liver, pancreas, left kidney had normal echogenicity and size, but the right kidney could not be found. A solitary mass characterized by mixture of mostly anechoic and hyperechoic compounds in the position of right kidney (Figure 1) was observed. The mass was 9.5x7.5 cm in dimension. Distal acoustic enhancement was seen with the mass. No abdominal fluid was detected.

2) URINE CYTOLOGY

Smears prepared from concentrated samples by centrifugation and stained with Giemsa revealed transitional epithelial cells, and large clusters of markedly pleomorphic cells (polygonal, cuboidal and columnar) with especially marked variation in cellular staining and size and cytoplasmic vacuolization. Within the clusters, very large cells with indistinct borders were found. They had slightly eosinophilic cytoplasm (Figure 2A). Some cells had abundant coarse chromatin nets and occasionally prominent nucleoli (Figure 2B). Some renal epithelial cells had loss of nuclear material and large clear vacuoles (Figure 2B). Mitotic figures in some cells were observed. According to urine cytology findings, cells were neoplastic [15].

3) BACTERIOLOGIC CULTURE OF THE URINE SPECIMEN

The urine specimen obtained for bacteriologic culture did not yield bacterial growth after 7 days of incubation.

To conclude, the clinic, bacteriologic, ultrasonographic findings and cytology of urine sediment suggested that the mass invading the right kidney could be a neoplasia (e.g. lymphosarcoma or renal cell carcinoma).

4) MASS REMOVAL AND PATHOLOGIC FINDINGS

After fluid therapy, explanatory celiotomy was performed. A big mass occupying the right half of the peritoneal cavity



FIGURE 1. — Ultrasonographic view of the mass characterized by mixture of mostly anechoic and hyperechoic compounds and distal acoustic enhancement on the right abdominal quadrant.

was found at laparotomy, and then it was noticed that the mass was the right kidney. It was replaced by a massive ball shaped tumour with surface irregularities. Unilateral nephrectomy was performed using standard techniques. Visual inspection and palpation of the left kidney, liver, spleen, intestine, bladder, prostate, pancreas and lymph nodes did not reveal associated lesions. Postoperative recovery was unremarkable. After nephrectomy, tissue samples were fixed in 10 per cent buffered formaldehyde, routinely processed and embedded in paraffin wax. Sections cut at 5 μ m thickness were stained with haematoxylin and eosin (H&E).

Macroscopic findings

The shape of the resected kidney had multinodular appearance and it was 9.5x 7.5x 5 cm in dimension (Figure 3). Removing the capsule was rather difficult. After its removal, the renal convex surface was found to be bulgy and yellowish or whitish in colour. Reddish to dark brown foci of haemorrhage were seen. On the cut surface, normal renal tissue was hardly seen because the cortex and medulla were completely replaced by the tumoral masses which were also detected in the renal pelvis.

Microscopic findings

Microscopic examination of the tumour showed mostly pleomorphic, cuboidal-to-columnar epithelial cells forming irregular tubules and papilliferous projections (Figure 4A). In the tumour, there were some solid arrangements consisted of the cells with clear cytoplasm, and these solid structures were surrounded by a fibrous tissue (Figure 4B). The nuclei of neoplastic cells were round to oval and contained prominent one or two nucleoli (Figure 4B). The mitotic rate was high, and necrosis was frequently detected in some neoplastic cells far from the vessels. At the periphery of the tumour, renal parenchyma could be seen as a thin zone due to compression of the tumour masses. Necrosis, haemorrhage and mineralization were detected in the central area of the large tumour nodules. Stroma of the neoplasm was highly vascularized and hyperaemic, and in some of the vessels necrosis and/or thrombosis were also seen. Destroying of pelvic epithelium due to extension of necrotic areas was also seen. In addition to degeneration and desquamation of pelvic epithelium, haemorrhage and oedema in sub epithelia connective tissue were observed.

5) OUTCOME

Two days after the surgery, clinical signs were not observed. The urine analysis was normal. Normal appetite was observed, but the owner didn't seek our attention and wanted the dog to be discharged. The dog died at home 4 days after surgery and was buried without necropsy.

Discussion

Primary renal neoplasms are uncommon in dogs and they are reported to be found to constitute only 0,3 to 1,7 % of all neoplasms in this species. Of these primary neoplasms, most are renal carcinomas [4]. Unlike in humans, more than 90 % of primary renal tumours in dogs and cats are malignant.

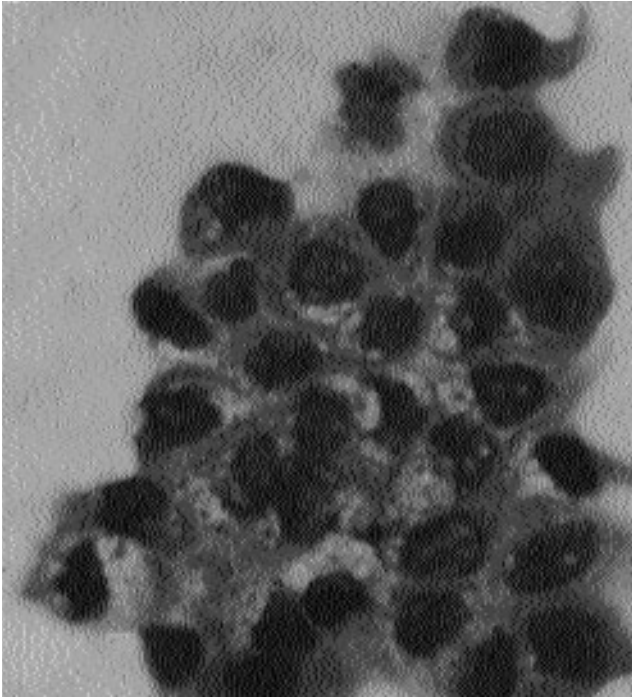


FIGURE 2A. — Clusters of markedly pleomorphic cells (polygonal, cuboidal and columnar) with especially marked variation in cellular staining and size and cytoplasmic vacuolisation. Giemsa stain x1330.

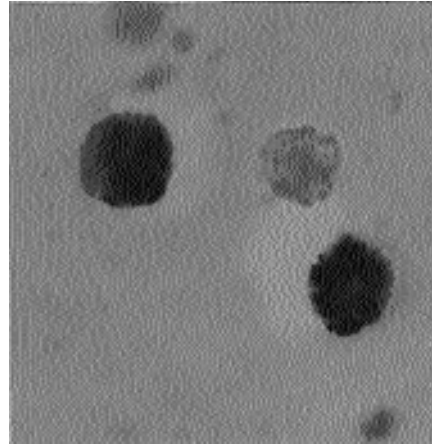


FIGURE 2B. — Renal epithelial cells; with abundant coarse chromatin nets and occasionally prominent nucleoli. Giemsa stain x1330.

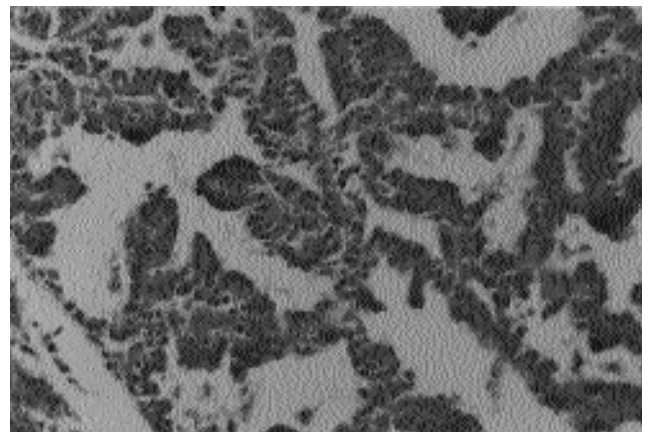


FIGURE 4A. — Pleomorphic and cuboidal -to-columnar epithelial cells forming irregular tubules and papilliferous projections, H&E x300.

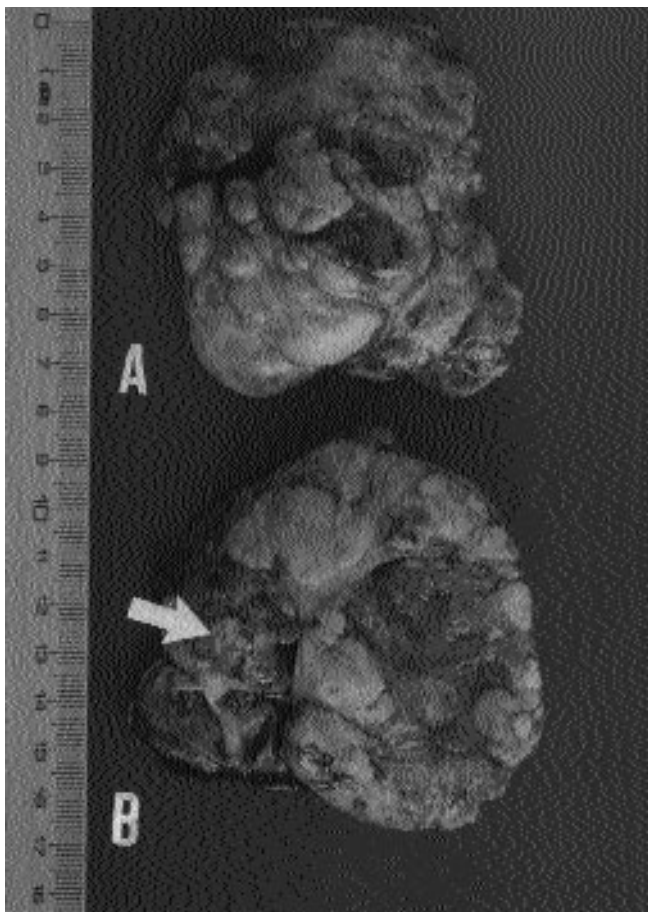


FIGURE 3. — Macroscopic appearance of tumour with irregular surface (A) and cut surface (B). Whitish to yellowish colored tumoural mass separated by fibrous bundles. Note pelvic involvement (arrow).

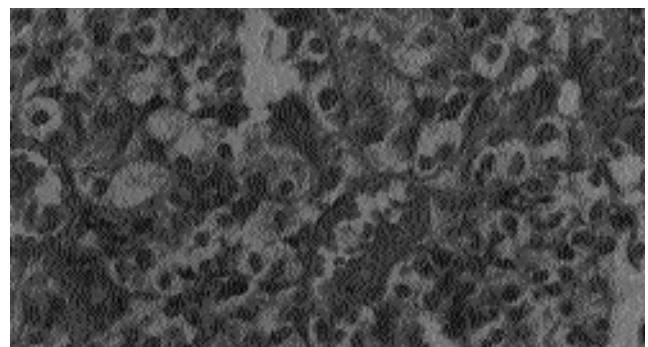


FIGURE 4B. — The neoplastic cells with clear cytoplasm forming solid structure, H&E x530.

Although carcinomas (tubular adenocarcinomas, transitional cell carcinomas) are the most common primary renal neoplasm in dogs, the general rate of renal cancer is fairly low [8].

The most common clinical signs of renal carcinoma in dogs are anorexia, weight loss, and palpable abdominal mass. Fever, haematuria, thoracolumbar tenderness, and lameness or signs of bone-associated pain are sometimes observed [4,

5]. In our case, the most pronounced clinical symptoms were anorexia, abdominal distress, distention, palpable mass originating from the right kidney and haematuria. A variety of secondary syndromes have been recognized in human patients with renal neoplasms; the most commonly reported «paraneoplastic» syndromes are erythrocytosis, hypercalcaemia, fever, hepatomegaly, hypertension, hyperglobulinemia, and amyloidosis [2, 6, 12].

The hematologic findings in this case were: anaemia, leucocytosis and mild thrombocytosis that might have occurred secondary to hemorrhage (hematuria), increased production of interleukins because of necrosis in neoplastic lesions [14]. Biochemical abnormalities could all be secondary to renal insufficiency [13, 14]

Epithelial cells may appear in small numbers in urine, but it may increase in animals with, neoplasia or inflammation of the urinary tract. In a patient with persistent hematuria and innumerable epithelial cells, cytologic examination of the urine is a useful screening procedure for neoplasia. Transitional epithelial cells originate from pelvis renalis, ureters, bladder and proximal urethra. In the presence of clusters of transitional epithelial cells in urine sediment, both transitional cell carcinoma and lower urinary tract infection should be taken into consideration [13]. Finding of abundant transitional epithelial cells together with so many atypic cells in our dog suggested us to perform urine cytology. The tumour transitional epithelial cells seen in urine samples might have resulted from destroying effect of tumour invasion to renal pelvis epithelium.

NIELSEN *et al.* [9] stated that renal cell carcinoma may be subdivided according to their predominant histological pattern, which may be solid, tubular, or papillary, or according to their cytological characteristics, which may be clear cell, granular eosinophilic, or basophilic, and either cuboidal or columnar. These forms may be of uniform type, but not infrequently, more than one histological pattern can be found in different areas of the same tumour [8, 9]. Similarly, in this case, solid, tubular and papillary patterns were observed in some areas of the same kidney.

In the light of these results, we concluded that this case was a renal cell carcinoma according to pathological findings, and urine cytology would be a valuable diagnostic tool in suspected cases.

References

1. — ARAI C., ONO M., UNE Y., SHIROTA K., WATANABE T. and NOMURA Y. : Canine renal carcinoma with extensive bone metastasis. *J. Vet. Med. Sci.*, 1991, **53**, 495-497.
2. — BONSI B.S.M., GIBSON D., MHOON M. and GREENE G.F. : Renal sinus involvement in renal cell carcinomas. *Am. J. Surg. Pathol.*, 2000, **24**, 451-458.
3. — DAGLI M.L.Z., CALDERARO F.F., SILVA M.T. and GUERRA J.L. : Squamous cell carcinoma of the renal pelvis with metastasis in a dog. *J. Comp. Pathol.*, 1997, **116**, 397-402.
4. — LAPPIN M.R. and LATIMER K.S. : Hematuria and extreme neutrophilic leukocytosis in a dog with renal tubular carcinoma. *J. Am. Vet. Med. Ass.*, 1988, **192**, 1289-1292.
5. — LUCKE V.M. and KELLY D.F. : Renal carcinoma in the dog. *Vet. Pathol.*, 1976, **13**, 264-276.
6. — MADEWELL B.R., WILSON D.W., HORNOF W.J. and GREGORY C.R. : Leukemoid blood response and bone infarcts in a dog with renal tubular adenocarcinoma. *J. Am. Vet. Med. Ass.*, 1990, **197**, 1623-1625.
7. — MEYER D.J. and HARVEY J.W. : Veterinary Laboratory Medicine, Interpretation and Diagnosis. Second Ed., Editors : Meyer, DJ and Harvey JW, WB Saunders Company, USA, 1998
8. — MOULTON J.E. : Tumours of the Urinary System. In : MOULTON J.E. (Ed) : Tumours in Domestic Animals, 2nd Ed., University of California Press Berkeley, 1978, 288-306.
9. — NIELSEN S.W., MACKAY L.J. and MILDORP W. : Tumours of the kidney. *Bulletin of W.H.O.*, 1976, **53**, 237-245.
10. — OWEN L.N. : Identifying and treating cancer in geriatric dogs. *Vet. Med.*, 1991, **86**, 55-66.
11. — ÖZEN H., COLOWICK A. and FREIHA S. : Incidentally discovered solid renal masses: what are they?. *Br. J. Urol.*, 1993, **72**, 274-276.
12. — ROSENBLUM D.Z. : Paraneoplastic syndromes associated with renal cell carcinoma. *J. Scan. Med. Ass.*, 1987, **83**, 375-378.
13. — TURGUT K. : Veteriner Klinik Laboratuvar Teşhis, ??? pages, Bahçivanlar Basım San. AŞ., Konya, 2000.
14. — von KNORRING J., SELROOS O. and SCHEININ T.M. : Haematological findings in patients with renal carcinoma. *Scan. J. Urol. Neph.*, 1981, **15**, 279-283.
15. — ZINKI J.G. : Urinary Sediment and Cytology of the Urinary Tract. In : COWELL R.L., TYLER R.D., MEINKOTH J.H. (Eds) : Diagnostic Cytology and Hematology of the Dog and Cat. 2nd Ed. Mosby Inc, St. Louis, 1998, 211-230.