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COMPUTER TOMOGRAPHY DIAGNOSIS OF URINARY BLADDER TUMOR IN A DOG – A CLINICAL CASE

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ABSTRACT

Bladder tumors in the dog are the most common tumors of the urinary tract. A large percentage of these tumors are malignant (97%) and of epithelial origin (97%). Transitional cell carcinoma (TCC) being by far the most common bladder tumor in dogs (87%).

A CT examination of the last thoracic and lumbar vertebrae was performed on a Cane Corso dog due to to hind limb weakness. The CT scan showed a neoplasm formation in the trigone area of the bladder, with an irregular surface extending circumferentially around the bladder neck and obstructing the ureteral openings, heavily enlarged ureters and hydronephrosis.

Key words: urinary bladder, trigone, tumor, CT, dog.

Introduction

Bladder and urethral tumor formations account for <0.5% of all canine tumors. Most of these neoplasms are malignant (97%) and of epithelial origin (97%) [12]. The most common bladder neoplasm in dogs (87%) is transitional cell carcinoma (TCC). Other types of bladder neoplasms such as squamous cell carcinomas, adenocarcinomas, undifferentiated carcinomas, and various sarcomas are rarely diagnosed [8]. Among them, rhabdomyosarcoma (RMS, bariatrio sarcoma) is extremely rare, representing <0.5% of all bladder tumors [9, 20].

Tumors of the lower urinary tract in dogs can affect the kidneys, ureters, bladder, prostate, or urethra. The most common areas in which tumors are diagnosed are the area of the trigone or the trigone and the urethra. The cause of naturally occurring lower urinary tract (LUT) cancer is unknown. The local application of insecticidal drugs for control of fleas and ticks [4] and the use of cyclophosphamides, herbicides and pesticides are seen as predisposing factors due to their role in bladder tumorigenesis [10, 21]. Other predisposing factors are obesity and breed predisposition (e.g., Scottish Terrier). A number of studies indicate that female dogs are more likely to develop bladder neoplasms than male. This is attributed to the more frequent urination of male dog to mark their territory which could result in less exposure time of their epithelium to carcinogens in the urine. In addition, female dogs have increased body fat than male dogs and therefore, increased storage of lipophilic environmental carcinogens [7].

The common symptoms include hematuria, stranguria, and other forms of dysuria, incontinence and, less commonly, lameness, lethargy and weight loss. Similarly, Norris reported dysuria (84%), grossly visible hematuria (50%) and pollakiuria (37%) as the most frequent clinical symptoms in 115 dogs with bladder or urethral tumors [12].

Clinical staging of bladder malignancy is important for assessing prognosis and planning treatment [13] and different imaging diagnostic methods are used in diagnosing LUT tumors. These methods also provide information about structural changes and the stage of tumor development. Various radiographic techniques are used, including excretory urography, lymphangiography, sonography and cystography [22]. Seidelman et al. reported an accuracy rate of 81% in CT staging of

bladder neoplasms. They suggested that CT may be useful as a routine procedure in the initial staging of bladder malignancy [18, 19]. Spiral CT provides cross-sectional images with an estimate of neoplasm size and localization and allows for visualization of the anatomical and morphological structure of tumor formations in the LUT [6].

Materials and methods

An 8-year-old male Cane Corso dog was referred to the clinic with neurological issues in the thoracolumbar area and was admitted for a CT examination. The dog had worsening dysuria, pollakiuria, hematuria, 1-month long incontinence and paralysis of the hind limbs. The dog had been treated for cystitis by the referring veterinarian.

Computer Tomography (CT) Examination

The dog was anesthetized with xylazine – 0.5 mg/kg i.m., propofol 5–7 mg/kg i.v. to deeper the narcosis and with propofol 0.2–0.5 mg/kg / min for maintenance.

The animal was not fed for 10–12 hours before the examination. It was positioned in sternal recumbency; its head was positioned between the fore limbs in the direction of the CT gantry.

The first CT scan was one without an intravenous contrast; the 2nd one was done with contrast using ultraviolet iodine contrast (ULTRAVIST ® 370 769 mg / ml solution for injection / infusion iopromide) through a catheter via an infusion pump – 0.5 ml per 1 sec. The CT was performed by Picker® CT PQ 5000 spiral CT. The slices were at intervals of 2 mm and were 1.5 mm thick. The scanning was carried out by the DICOM Viewer computer software ®.

Results

The first CT image is native is visualizing the right and left kidneys and the ureters. Bilateral hydronephrosis and highly dilated renal pelvis were observed (Fig. 1). Hydroureters can be seen on Figures 1, 2, and 3. The ureters are expanded and visualized along their entire length. Their diameter in the distal parts is about 11 mm. Thickening of the bladder wall in the trigone area and mass pass caudally and merges with the prostate gland (Fig. 5). The density of the bladder wall varies from 35 to 60 HU. After administration of a contrast material, saturation of the thickened bladder wall and prostate gland was established (Fig. 4, 5). A mass (3.5 cm in size) with heterogeneous structure and an irregular surface, located in the trigone area, obstructing the ureteral openings was found. Positive-contrast CT scan showed a large filling defect in the bladder, mainly located in the trigone area. The density of the mass varied from 100 to 150 HU (Fig. 4).

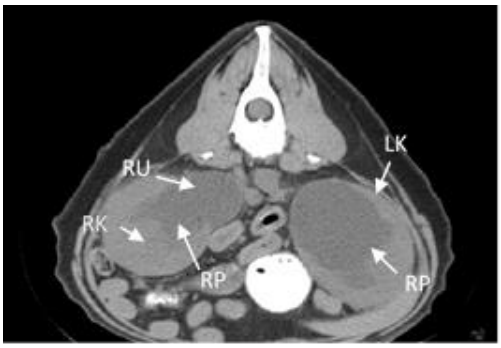

Figure 1: CT image of the right and left kidneys: RK – right kidney, RU – right ureter, LK – left kidney, RP – renal pelvis.

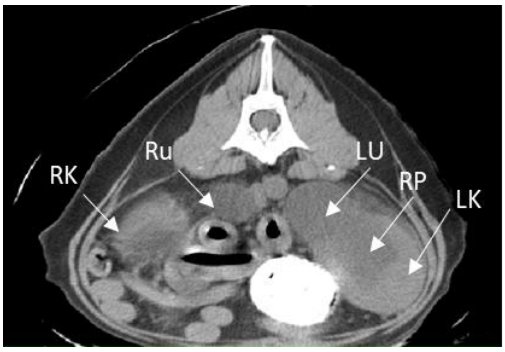

Figure 2: CT image of the right and left kidneys and ureters: RK – right kidney, RU – right ureter, LK – left kidney, LU – left ureter, RP – renal pelvis.

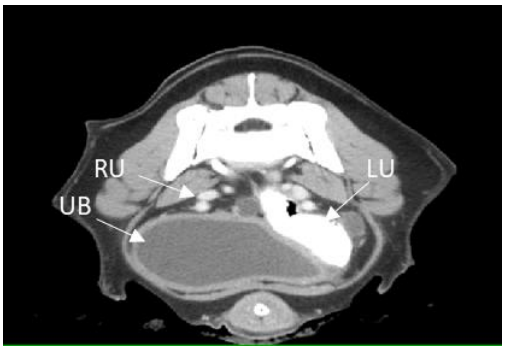

Figure 3: CT image of the right and left ureters and urinary bladder: UB – urinary bladder, RU – right ureter, LU – left ureter.

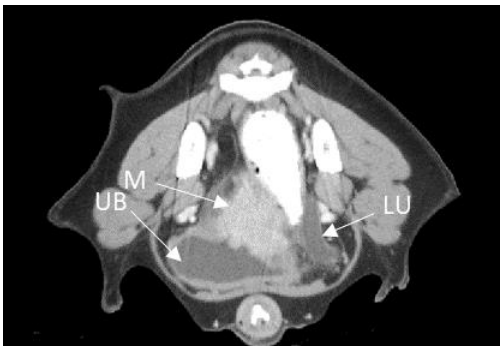

Figure 4: CT image of the mass in the urinary bladder: M – mass, UB – urinary bladder, LU – left ureter.

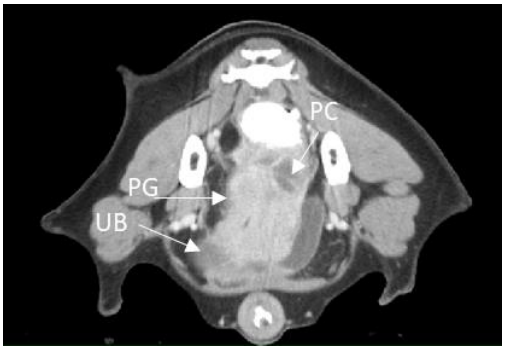

Figure 5: CT image of the urinary bladder and prostate gland: UB – urinary bladder, PG – prostate gland, PC – prostate cyst.

Discussion

Numerous imaging diagnostic methods have been used to detect bladder neoplasms. They include standard methods such as IV urography, cystography, ultrasonography, CT and MRI or more complex tests such as double-contrast cystognaphy [14], polycystography [16] and standard CT of

the bladder combined with gas distention of the lumen of the bladder [19]. CT is unique in its ability to accurately assess soft tissue structures in a cross-sectional dimension. Such a three-dimensional display is optimal for staging bladder neoplasms. Before the advent of helical CT, the performance of CT urography was suboptimal, with sensitivities as poor as 50% [11]. The ability of helical CT to obtain thin slices has vastly improved its ability to assess urothelial tumors. The advantages of CT to inspect the urinary tract in multiple planes and assess for periureteric and renal infiltration as well as for nodal and distant metastases, has thus provided both urothelial and metastasis surveillance in a single examination [2].

The main role of CT in the diagnosis of bladder cancer is to examine the regional lymph nodes for the presence of metastasis. When the CT examination showed negative results, the lymph nodes containing tumor pockets were not enlarged. In our study, the intra-abdominal and pelvic lymph nodes did not appear enlarged. In the early stages of development, TCC is typically seen on a CT scan as small filling defects, a mass lesion, or circumferential wall thickening in the urothelial wall [1, 5]. Investigators have suggested that the ability to detect urothelial thickening makes CT urography potentially superior to excretory urography for detection of TCC [1].

Conclusion

Contrast CT examination is very accurate at identifying masses larger than 0.5 cm and can show mucosal abnormalities as small as 2 mm. It is minimally invasive and can be diagnostic when conventional excretory urography is inconclusive. It can indicate appropriate areas for assessment and biopsy at conventional examination. Understanding the appearances of LUT tumors on different imaging techniques is important in the accurate interpretation of imaging studies. Newer techniques such as Contrast CT examination are now increasingly used instead of conventional excretory urography in the surveillance of the LUT in patients with bladder cancer.

The type of tumor cannot be defined on the basis of CT examination. The type of tumor is determined by histological examination.

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