

Renal Cell Carcinoma in a Pekingese Dog

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Abstract: An intact female, 5-year-old, Pekingese, weighing 3.5 kg with a history of a palpated abdominal mass was referred to Veterinary Medical Teaching Hospital, Seoul National University. In laboratory examination, there were no remarkable abnormalities. Radiographic findings included a left mid-abdominal mass with ill-defined margin, serosal detail loss of peritoneal space, non-uniform opacity of retroperitoneal space, and a radiopaque cystic calculus. On abdominal ultrasonography, a heterogeneous parenchymal mass with irregular contour in the left renal region was found. Computed tomographic findings showed a tumor embolus within the caudal vena cava and an invasion into mesentery, small bowel loops, spleen and pancreas around the large left renal mass. Unilateral nephroureterectomy was performed. Histopathologic examination of the resected mass confirmed the diagnosis of renal cell carcinoma. The dog died one day after surgery. Although ultrasonography could give diagnostic information about mass characteristics, computed tomography (CT) can provide key imaging features of mass characteristics.

Key words : radiography, ultrasonography, CT, renal cell carcinoma, dog

Introduction

Primary renal tumors are uncommon in dogs and account for less than 2% of all canine cancer, while tumors metastasize to the kidneys are more frequent^{2,14}. A male predilection is noted in renal tumors of epithelial origin in dogs. Clinical signs in dogs with renal tumors are often nonspecific and may include anorexia, depression, weight loss, and in some cases abdominal distension¹⁵. The features of radiography, ultrasonography and computed tomography (CT) in a 5-year-old intact female Pekingese diagnosed with a renal cell carcinoma were reported here.

Case

Case history and clinical findings

An intact female, 5-year-old, Pekingese, weighing 3.5 kg with a history of a palpated abdominal mass was admitted to Veterinary Medical Teaching Hospital, Seoul National University. Medication for dermatitis and intermittent vomiting was provided a few months ago and anorexia, vomiting, melena, and hematuria were observed recently. Heart and respiratory rates were within normal range. Serum biochemical parameters showed elevations of GGT (181 U/L), AST (61 U/L), while BUN, creatinine, ALT, and ALP were normal.

Diagnostic imaging

Abdominal plain radiographs showed a 5.5 cm left mid-abdominal mass sized with ill-defined margins, serosal detail loss of peritoneal space, irregular opacity of retroperitoneal space, and a radiopaque cystic calculus. Dorsal deviation of some segments of intestines and ventral displacement of colon

were observed.

Abdominal ultrasonography revealed a round to oval heterogeneous parenchymal mass with irregular contour around the left renal region, while the right kidney was normal. Abnormal vascular signals were observed on Doppler sonography. Enhanced CT with 2 ml/kg of contrast agent (Omnipaque®, Nycomed, Norway) intravenously followed by plain scan (3 mm slice thickness, pitch 1) showed an irregularly enhanced mass with multifocal hypo-enhanced areas in the region of the mass. Particularly, a filling defect within segmental dilated caudal vena cava indicated a tumor thrombosis. Mesentery and small bowel loops, pancreas, and left adrenal gland were invaded by the large left renal mass. Reformatted sagittal image supported the invasion of the renal mass to caudal vena cava. The coronal image sustained the assault of the renal mass to the adjacent organs. Especially, the caudal margin of the mass abutted and possibly adhered to the mesentery and small bowel.

Surgical treatment and gross findings

Unilateral nephroureterectomy, hysterectomy, and cystotomy were performed at a time. The mass was approximately 67 cm in size, irregular in contour and ivory in color. The renal mass was entrapped by mesentery and attached with some small bowel segments, mesentery, pancreas, left ovary, a part of uterine horn. The extent of invasion of caudal vena cava was not examined completely.

Histopathologic examination

The resected mass was confirmed as a renal cell carcinoma.

Clinical outcome

The dog died one day after surgery.

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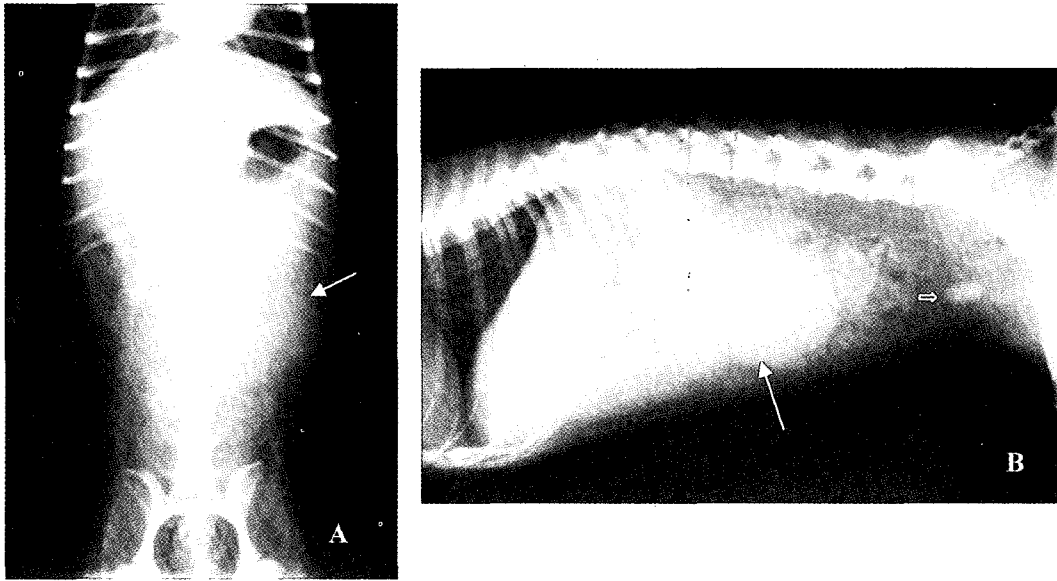


Fig 1. Abdominal radiographs, ventrodorsal (A) and lateral (B) views. A round to oval shape, 5.5 cm size, soft tissue opacity mass (arrow) in the mid-abdomen is observed on both projections. Due to the mass, some small bowels are displaced right caudolaterally (A), and caudoventrally (B), and descending colon is displaced ventrally (B). In the retroperitoneal space, irregular soft tissue opacities are found. A solitary, elongated oval shape, mineral opacity calculus (small hollow arrow) is also observed within the urinary bladder (B).

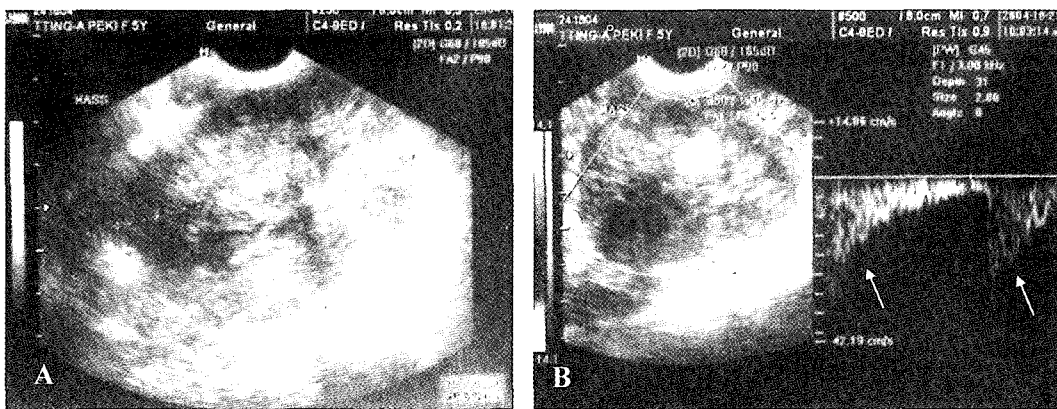


Fig 2. Abdominal ultrasonography of the left abdominal mass. (A), A solitary large renal mass approximately 7.5 cm is shown. (B), Pulsed Doppler showed abnormal high blood flow velocity (arrows) within the mass. Also, the mass has heterogeneous parenchymal echogenicity.

Discussion

Primary renal tumors are infrequent in dogs and have been also reported in many species such as horses, cows, cats, pigs, and rabbits^{2,13,17,23,28}. The reported incidence is between 0.3% and 1.7% of all reported tumors in dogs^{6,7,12}. Renal tumors are usually malignant and tend to metastasize widely and randomly, including to bone, renal pelvis, ureters, or adjacent blood vessels^{7,8,14,22}. They are also often unilateral and affect the pole of the kidney, although bilateral involvement is possible. No breed predilection is reported for primary renal tumors in dogs, but male-female ratio of epithelial

renal tumors has been reported 1.6:1¹⁴. The reported mean age of dogs with epithelial origin renal tumors is 9.1 years¹². The biology of many urinary tract tumors is such that they carry a guarded prognosis but the quality of life of the patients may be significantly improved with early diagnosis and the instigation of appropriate medical management⁴. The number of cases of renal tumors reported in the veterinary literature is limited. Metastasis is a concern for any of the malignant renal tumors. Pulmonary metastasis was detected radiographically in 13 of 38 dogs with primary renal tumors¹⁴. While survival of dogs with malignant renal tumors is generally short, long-term survival (up to 4 years) has been reported^{5,14,17,25}.

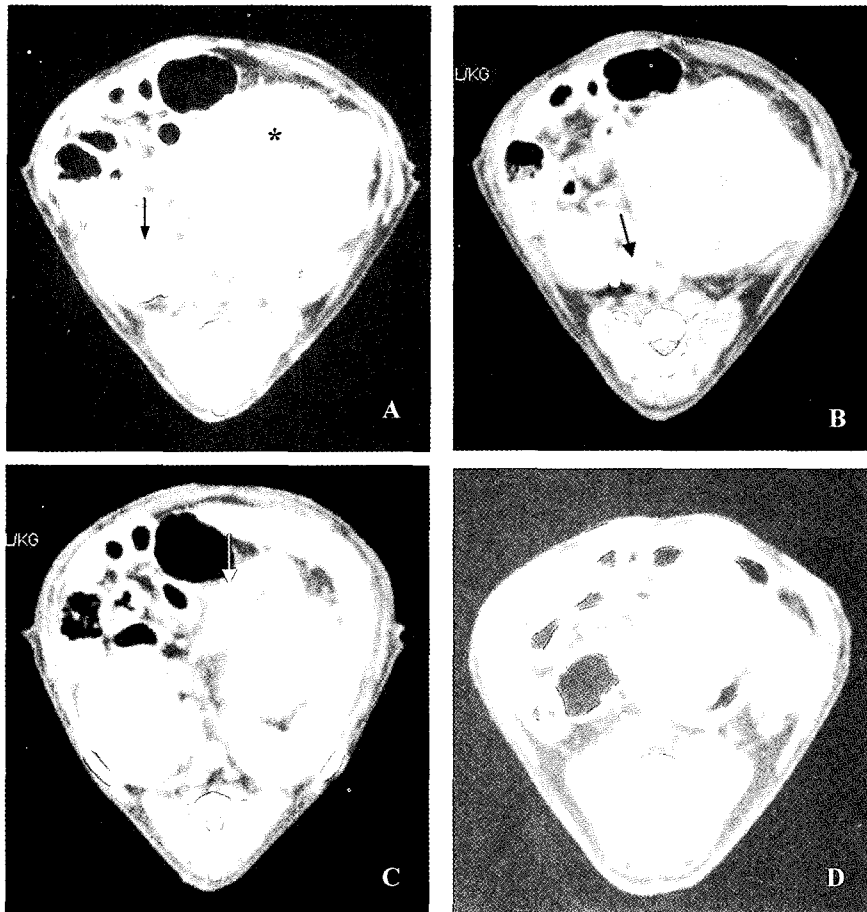


Fig 3. The contrast enhanced CT images of abdomen. (A), an irregularly enhanced mass with multifocal hypo-enhanced regions (asterisk) is identified compared with normal right kidney (arrow) on early phase. (B), the tumoral embolus within segmentally dilated caudal vena cava (arrow) is identified on delayed phase. (C), Pancreas (arrow) is invaded by the tumor mass. (D), Mesentery and small bowels seem to be infiltrated with the tumor tissue on arterial phase.

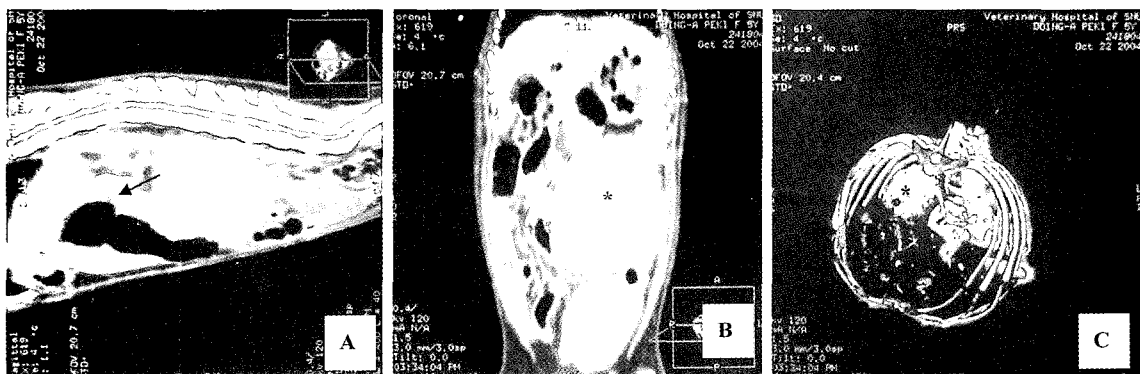


Fig 4. The Reformatted CT images. (A), Sagittal image. The invasion of CVC and renal vein (arrow) is identified in the image. (B), Ventrodorsal image. The mass is in the left mid-abdomen. It has irregular contour. The enhanced mass may invade the mesentery and adjacent organs. (C) 3-D image. The image provides the anatomic location of the mass (asterisk).

The most common clinical signs of primary renal tumors in dogs are anorexia, depression, weight loss, abdominal mass (detectable in approximately 50% of cases), abdominal pain,

vomiting, dysuria, pollakiuria, and hematuria^{10,14,22,26}. Reported clinical laboratory findings in animals with primary renal tumors vary widely, but include anemia (regenerative or nonregener-

ative), polycythemia, leukocytosis, hypercalcemia, azotemia, and occasionally elevations in activity of serum ALP and ALT^{7,8,12,14}. Urinalysis often reveals gross or microscopic hematuria with or without proteinuria, and bacteriuria¹². Physical examination may reveal a mass or, in some cases, pain, in the region of kidneys. Gross hematuria is not a consistent finding¹⁵. This patient with nonspecific signs such as anorexia, vomiting, and hematuria showed elevations of GGT (181 U/L), AST (61 U/L), and normal values of BUN, creatinine, ALT, and ALP.

It is well known that primary renal tumors may not be difficult to diagnose using cautious palpation, thoracic and abdominal radiographs, contrast studies of the urinary tract, ultrasonography of the abdomen as well as kidneys, and routine urinalysis and hematology.

Abdominal palpation may reveal a mass or renomegaly, and abdominal radiographs may confirm or disclose an anticipated renal mass. Lung metastasis is reported to be radiographically detectable in approximately one third of cases at the time of initial diagnosis¹⁴. The irregular large mass, approximately 5 × 7 cm considered renal neoplasia was observed in the renal region on abdominal radiograph and no metastatic evidence was found on thoracic radiograph²⁴. Though excretory urography can be helpful in delineating a neoplasm from normal renal tissue in more than 96% of cases¹⁴, some contrast studies of patients with primary renal tumors may be normal¹¹. Regarding this matter, contrast radiographic study was not considered in this case. Ultrasonography has been shown to be more sensitive than excretory urography and renal angiography for detecting slight alterations in renal contour caused by experimentally produced renal carcinoma¹. Ultrasonography, however, has limited use in discriminating benign lesions, such as abscesses or hematomas, from malignant lesions, such as adenocarcinoma¹⁶. On occasion, where a mass in the kidney region is exceptionally large, it may be difficult to determine whether the mass arises from the kidney or has instead displaced the kidney from its normal position²⁰. Meanwhile, the vascularity of renal masses can be assessed with Doppler ultrasonography for evidence of tumor signal suggesting a tumor²¹. A heterogeneous parenchymal mass with irregular contour around the left renal region was detected by ultrasonography and abnormal vascular signals similar to 'tumor signal' were observed on Doppler sonography. However, the sonographic assessment of other major vessels such as the caudal vena cava, and abdominal vessels was not completed.

Recently, a few studies using CT have been reported^{10,18,23}. CT images in renal tumors were well correlated with macroscopic findings, and contrast CT images were quite useful in differentiating tumoral regions from non-tumoral ones¹⁰. In addition, CT may also provide useful information, especially to facilitate surgical planning. Evaluation of possible extension of the tumor into the vena cava is important if surgery is being considered¹⁵. Computed tomography has shown that the neoplastic tissue spread into the lymph nodes, the wall of the

caudal vena cava, the liver and lungs. The right renal vein, caudal vena cava and iliac veins appeared enlarged and secondarily thrombosed. A diagnosis was made of renal tubular cell carcinoma with secondary venous thrombosis²³. In this case, an irregularly enhanced mass with multifocal hypo-enhanced regions within the mass was identified. Moreover, mesentery and small bowel loops, pancreas, and left adrenal gland were invaded by the large left renal mass. Especially, the filling defect on the dilated caudal vena cava partly indicated a tumor thrombosis. Reconstructed sagittal image revealed clearly the invasion into the caudal vena cava by the renal mass. The coronal image showed the assault of the renal mass to the adjacent organs. The renal vein and caudal vena cava were invaded as well as the adrenal gland, pancreas, and small bowels in this case.

Concerning treatments, other than surgery, no effective immunotherapy or chemotherapy agents have been identified¹⁵. Careful assessment of overall renal function and the contralateral kidney is an important part of patient evaluation prior to surgery. It is obviously important to have confidence that the contralateral kidney can sustain life after surgery.

It is known that the cause of death in most dogs with primary renal tumors is euthanasia because of the onset of renal failure, metastasis, or complications of surgery^{12,14}. Unfortunately, the patient died a day after surgery possibly due to surgical stress and extensive invasion of renal tumor into various organs, although it is a single case of renal cell carcinoma featured in CT scan, this report could provide advisable guideline for clinicians in assessing the tumor patient in the view of diagnostic imaging.

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페키니즈견에서 신장세포암종

이기창 · 정주현 · 변예은 · 오선경 · 서은정 · 송경진 · 권오경 · 윤정희 · 최민철¹

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요 약 : 5년령 페키니즈가 촉진가능한 복강종괴 때문에 서울대학교 부속동물병원에 내원하였다. 실험실 검사에서 특별한 이상은 없었다. 방사선 검사에서 경계가 분명한 좌측 복부중간에 종괴가 있고 복강내 장막선 손실, 후복강의 비정형성투명도, 그리고 방사선 불투과성 방광 결석 소견을 나타냈다. 복강초음파에서 좌측신장에 불규칙한 모양을 한 비균질성 실질종괴가 발견되었고 좌측대형신장종괴가 장간막, 소장, 비장, 췌장을 침습한 소견을 관찰하였다. 편측성 신장요관절제술을 실시하였다. 조직병리소견에서 신장세포암종으로 확진하였다. 수술후 다음날 환측은 폐사하였다. 비록 초음파검사로 종괴에 관한 진단적 정보를 알 수 있지만, 컴퓨터 단층촬영은 종괴의 특성에 관한 핵심 영상 소견을 나타낸다.

주요어 : 방사선촬영, 초음파촬영, 컴퓨터 단층촬영, 신장세포암종, 개