

Clinical Stabilization Following Nephrectomy in a Dog with High-Grade Renal Cell Carcinoma: A Case Report

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Abstract. Renal cell carcinoma (RCC) is the most common primary malignant renal neoplasm in dogs, although rarely encountered in practice and often diagnosed at advanced stages. We report the clinical presentation, diagnostic evaluation, surgical management, and histopathological findings of RCC in a dog. A 7-year-old castrated male domestic dog presented with acute weight loss, inappetence, and a poor body condition score of 2/5. Diagnostic workup included clinical examination, hematology, serum biochemistry, abdominal radiography, exploratory laparotomy, and subsequent histopathological assessment of the excised renal mass. Clinical examination revealed cachexia, and abdominal palpation identified a firm ventral abdominal mass. Serum biochemistry demonstrated mild azotemia with elevated creatinine (1.19 mg/dL) and normal urea (90 mg/dL), resulting in a decreased BUN/creatinine ratio (12). Total protein (8.5 g/dL) and globulin (5.6 g/dL) were markedly elevated, with albumin remaining within the reference range (2.8 g/dL), leading to a reduced albumin/globulin ratio of 0.5. Vector-borne disease testing was negative. Abdominal radiography revealed a well-defined soft tissue opacity occupying the mid-abdomen, measuring approximately 13.9 × 13.3 cm. Exploratory laparotomy identified a well-encapsulated left renal mass, which was excised via unilateral nephrectomy. Histopathological examination confirmed a tubular-to-solid renal epithelial neoplasm with multifocal necrosis, hemorrhage, and a high mitotic index (72 per 10 high-power field), consistent with Grade 4 RCC, indicating poor prognosis. This case highlights the importance of comprehensive diagnostic evaluation and timely surgical intervention in canine renal tumors. Despite a poor prognosis associated with a high histological grade, curative-intent nephrectomy achieved clinical stabilization and short-term improvement in quality of life.

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1 Introduction

Renal cell carcinoma (RCC) represents the most common primary malignant neoplasm of the canine kidney, arising from the epithelial cells of the renal tubular system [1,2]. Although it accounts for less than 1% of all canine neoplasms, RCC is characterized by aggressive biological behavior, high metastatic potential, and poor long-term prognosis [3]. Most affected dogs are middle-aged to older, with an average age of onset between eight and nine years, and there appears to be no consistent sex or breed predisposition [4].

The clinical presentation of RCC in dogs is often nonspecific. Weight loss, anorexia, lethargy, hematuria or abdominal distension are the most frequent clinical manifestations observed. Due to the deep retroperitoneal location of the kidneys, renal tumors can grow substantially before becoming clinically apparent, and a palpable abdominal mass is detected in up to 40% of affected cases [3]. Unilateral nephrectomy continues to be the gold standard treatment for localized renal neoplasia, providing the best opportunity for prolonged survival and improved quality of life compared to medical management alone [5]. Histopathological evaluation, particularly assessment of the mitotic index, plays a crucial role in determining prognosis, as higher mitotic activity has been correlated with shorter median survival times [4]. In this report, we describe a seven-year-old male castrated dog that was diagnosed with RCC. The case details the dog's clinical presentation, diagnostic workup, surgical management, and histopathological confirmation.

2 Case Presentation

A 7-year-old male castrated domestic dog, living in a semi-outdoor environment with access to both commercial kibble and home-cooked meals, presented with progressive weight loss and inappetence. The owner reported reduced appetite despite consistent feeding practices, and a prior normal health evaluation was recorded one month earlier.

2.1 Physical examination and initial diagnostics

On clinical examination, the dog exhibited a body condition score (BCS) of 2/5, but remained alert and responsive. A complete blood count (CBC) and serum biochemistry panel (Chem 10) were conducted to assess internal organ function. Additionally, the IDEXX SNAP 4Dx Plus Test was performed to rule out vector-borne diseases, including *Ehrlichia canis*, *Anaplasma spp.*, *Borrelia burgdorferi*, and *Dirofilaria immitis*. Abdominal palpation revealed a firm mid-ventral mass. Abdominal radiographs were taken at right lateral and ventrodorsal views, showing a soft tissue opacity suggestive of an intra-abdominal mass, measuring 13.9 x 13.3 cm. Advanced imaging via computed tomography (CT) was considered but declined by the owner due to logistical constraints.

2.2 Pre-surgical preparation and surgery

An exploratory laparotomy was performed a week after the first blood test under general anesthesia. 200 mL of whole blood was aseptically collected and stored for possible transfusion. A well-encapsulated mass was identified in the left kidney, and a unilateral nephrectomy was performed with the owner's informed consent.

2.3 Histopathology examination

The excised renal mass weighed 0.8 kg, and a representative 2.8 × 2.6 cm section was submitted for histopathological examination. Cellular morphology, tissue architecture, and mitotic index were assessed to confirm the diagnosis of RCC.

2.4 Postoperative management and follow-up

Postoperative care included blood transfusion using the previously stored donor blood. The dog was monitored regularly, and a follow-up CBC and serum biochemistry were conducted 23 days later. The patient showed improved appetite and demeanor, and ongoing supplementation with Taheebo extract was initiated as part of supportive care.

3 Results and Discussions

3.1 Clinical findings

A 7-year-old male neutered domestic dog was presented for examination due to sudden weight loss noticed by the owner. The dog lives in a semi-outdoor environment and is fed a mixture of kibbles and home-cooked food, including sardine fish, twice daily. The owner's observation indicated that the dog only eats when hungry, resulting in inconsistent appetite. On physical examination, the veterinarian recorded a low body condition score (BCS) of 2/5. Despite the weight loss, the dog remained alert and responsive, showing interest in treats. A complete blood count (CBC) and SNAP 4Dx® test were conducted to investigate the clinical findings. Notably, the same patient had been examined a month previously during a routine annual health check-up and vaccination. At that time, the dog appeared healthy and alert, with a body weight of 21.8 kg. The owner confirmed regular monthly administration of Nexgard® and Heartgard® for ecto- and endoparasite prevention. The dog was reported to have free access between indoor and outdoor areas and cohabitated with four other dogs. The diet had remained consistent, consisting of commercial kibble and home-prepared food offered twice daily.

One month later, the owner reported a marked decline in the dog's appetite, consistent with anorexia, accompanied by significant weight loss. The progressive decrease in body mass, despite consistent feeding practices, raised concern for underlying cachexia, suggesting the possibility of a systemic or chronic pathological process. The owner noted that the dog would only consume small amounts of cooked chicken when offered, further emphasizing the severity of inappetence. On 31 March, the dog was presented for medical assessment. The dog's weight has dropped to 19kg, with a BCS of 2/5. Initial diagnostic investigation included a serum biochemistry profile (Chem 10 panel) (Table 1) and the IDEXX SNAAP 4Dx Plus test. Serum biochemistry profile (Chem 10 panel) revealed a normal glucose level (5.61 mmol/L) and mild azotemia with elevated creatinine (106 µmol/L) and normal urea (5.0 mmol/L). The BUN/CREA ratio was decreased (12). Additionally, total protein (8.5 g/L) and globulin (5.6 g/L) were markedly elevated, while albumin (2.8 g/L) remained within the reference range, resulting in a low albumin/globulin ratio (0.5). Liver parameters (ALT <10 U/L and ALP 45 U/L) were within normal limits.

Results from the IDEXX SNAP 4Dx Plus Test were negative, indicating no evidence of vector-borne disease at the time of testing. On physical and diagnostic imaging examination, a firm mass was palpated in the ventral abdomen. Due to delayed in manifestation, primary

tumor often grows to significant size before able to detect, with 20-43% reported to have palpable mass at the abdomen [3], which is consistent with the clinical signs observed in the dog during the examination.

Table 1. Serum biochemistry profile

Parameter	Unit	Result	Reference interval	Interpretation
Glucose	mmol/L	5.61	4.11-7.95	Normal
Creatinine	µmol/L	106	44-159	Normal
Urea	mmol/L	10	2.5-9.6	Normal
BUN/Creatinine ratio	-	12	-	-
Total protein	g/L	85	52-82	High
Albumin	g/L	28	23-40	Normal
Globulin	g/L	56	25-45	High
Albumin/Globulin Ratio	-	0.5	-	-
Alanine Aminotransferase	U/L	<10	10-125	Normal
Alkaline Phosphatase	U/L	45	23-212	Normal

To further evaluate the abdominal structures, radiographic imaging was conducted, including right lateral and ventrodorsal (VD) abdominal projections (Figure 1). The radiographs revealed a well-defined soft tissue opacity occupying the mid-abdominal region measuring 13.9 x 13.3 cm, resulting in reduced visualization of surrounding visceral organs due to superimposition and displacement. A computed tomography (CT) scan was recommended as a diagnostic tool to further evaluate the origin and extent of the abdominal mass. However, the owner declined this diagnostic option due to the limited availability of CT scan facilities in the nearby veterinary hospital and the considerable distance to the nearest hospital. Considering that surgical intervention would likely be required regardless of the imaging outcome, the owner ultimately decided to proceed directly with exploratory laparotomy.



Figure 1. Right lateral abdominal view (left) and ventrodorsal (VD) abdominal radiograph (right).

A preoperative blood donation was conducted to ensure the availability of standby transfusion support for the scheduled surgical procedure, a day prior to surgery. A total of 200 mL of whole blood was aseptically collected and properly stored. The surgery was

successfully performed, and the collected blood was subsequently transfused postoperatively to support the patient's recovery. Intraoperatively, a well-encapsulated mass originating from the left kidney was identified (Figure 2A and 2C). With the owner's informed consent, a decision was made to proceed with unilateral nephrectomy as the most appropriate therapeutic intervention, based on the clinical findings. The nephrectomy procedure, which lasted approximately four hours, was completed successfully without any intraoperative complications. The excised renal mass weighed 0.8 kg (Figure 2C). A representative section of the mass, measuring approximately 2.8×2.6 cm, was submitted for histopathological evaluation to obtain a definitive diagnosis.

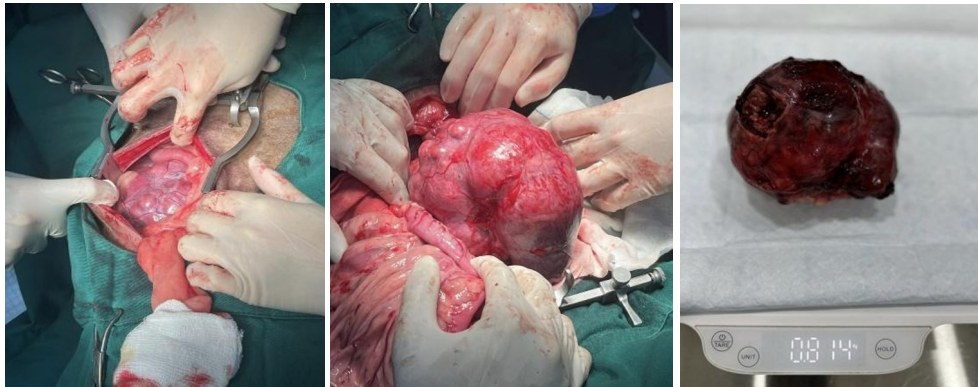


Figure 2. Intraoperatively, a well-encapsulated mass originating from the left kidney was identified; The mass weighed 0.8 kg.

In canine patients, unilateral nephrectomy is the gold standard for conditions such as renal neoplasia, end-stage hydronephrosis, renal abscessation, and renal dysplasia [7]. Canine that has been treated surgically has better survival rate as compared to medical therapy management [5]. With nephrectomy, clinical signs improve, hence reducing pain and morbidity, and contributing to better survival outcomes [3].

In chronic pathological conditions, affected kidney may be enlarged and can develop extensive neovascularization. This may cause renal artery and vein to be distorted, displaced or even absent. With that, surgical approach must be adapted to individual presentation [8]. In this case, the anatomical structures of the dog were still identifiable.

While reports detailing complications after canine nephrectomy are limited, clinicians should be aware of the potential perioperative and long-term risks of unilateral nephrectomy. Preoperative evaluation should include measuring of GFR to determine the functional capacity of the remaining kidney, along with blood pressure monitoring and management to reduce the risk of ischemic injury [9].

Based on histopathology examination reveal a poorly demarcated, cellular, and infiltrative neoplasm consisting of polygonal cells arranged in tubules and solid nests, supported by a variably collagenous stroma (Figure 3). Tumor cells are characterized by pink-stained cytoplasm and cell borders are inconsistent. Nuclei are round to oval, finely stippled, and contain zero to one variably distinct nucleolus. Moderate anisokaryosis is observed, with 72 mitotic figures identified per 10 high-power fields (400 \times). Multifocal areas of necrosis and hemorrhage are also present. The microscopic findings are consistent with renal cell carcinoma (RCC), a maglinant neoplasm originating from the tubular epithelium of the kidney. These tumors are typically unilateral, often affecting one pole of the kidney, and tend to exert expansive pressure on the adjacent renal parenchyma. Renal carcinomas in dogs are

known for their aggressive biological behavior and relatively high potential for distant metastasis, particularly to the lungs and other organs [1,2].

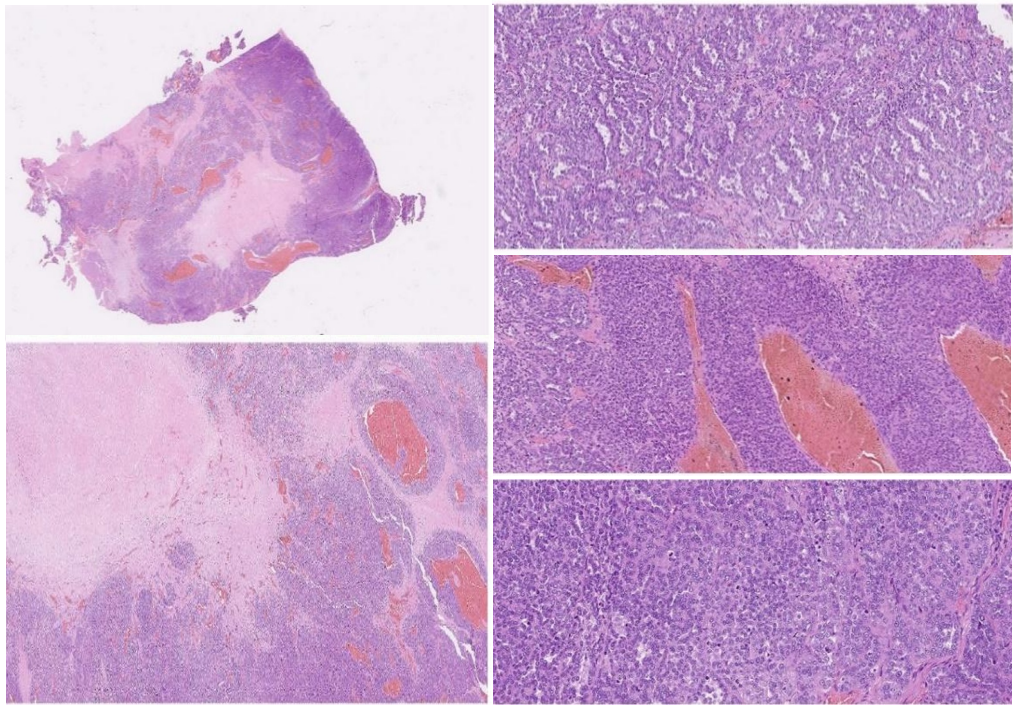


Figure 3. Histopathological features of tubular to solid renal cell carcinoma (H&E stain). A. Low-power view showing a poorly demarcated, densely cellular renal mass with necrosis and hemorrhage (2x). B. Multifocal necrosis and hemorrhage typical of high-grade carcinomas (4x). C. Tubular formations of polygonal tumor cells with eosinophilic cytoplasm and moderate nuclear atypia (10x). D. Neoplastic cells arranged in solid and tubular patterns within collagenous stroma, infiltrating surrounding tissue (10x). E. High-power view showing round to oval nuclei, anisokaryosis, and numerous mitotic figures, consistent with a high mitotic index (40x).

In this study, mitotic index was the most important predictor of survival in canine RCC, by representing an indirect measure of proliferative activity and can be assessed using routine diagnostic methods. It was the only variable shown to have independent prognostic value on multivariate analysis [4]. The prognostic significance of the mitotic index (MI) in canine RCC was highlighted in a study [4], which demonstrated that dogs with a MI greater than 30 exhibited the shortest median survival time (MST) of approximately 187 days. In contrast, a MI less than 10 had longer MST with 1184 days, while MI ranging from 10 to 30 shows median survival of 452 days. Additionally, the presence of clear cell carcinoma and clinical signs such as hematuria and cachexia were also associated with poorer survival outcomes. In this study, MI was recorded at 72, indicating a poor prognosis based on these findings [10].

A follow-up examination was conducted 23 days later, during which the dog weighed 20.5 kg. The owner reported a noticeable improvement in the dog's condition, with a return of appetite and a normal demeanor, characterized by alertness and a positive disposition. Overall, CBC and serum biochemistry were within normal reference interval, except for a decreased reticulocyte hemoglobin content (Table 2), which may indicate insufficient

hemoglobin synthesis during erythropoiesis, potentially associated with altered iron metabolism or reduced erythropoietic function following nephrectomy.

A follow-up examination was conducted 23 days later, during which the dog weighed 20.5 kg. The owner reported a noticeable improvement in the dog's condition, with a return of appetite and a normal demeanor, characterized by alertness and a positive disposition. Overall, the complete blood count and serum biochemistry results were within normal limits, except for a decreased reticulocyte hemoglobin content (Table 2), which may indicate insufficient hemoglobin synthesis during erythropoiesis, potentially associated with altered iron metabolism or reduced erythropoietic function following nephrectomy.

Table 2. Hematology and biochemistry profile

Parameter	Unit	Result	Reference interval	Interpretation
RBC	x10 ¹² /L	6.14	5.65-8.87	Normal
HCT	%	42/2	37.3-61.7	Normal
HGB	g/dL	13.8	13.1-20.5	Normal
MCV	fL	68.7	61.6-73.5	Normal
MCH	Pg	22.5	21.2-25.9	Normal
MCHC	g/dL	32.7	32.0-37.9	Normal
RDW	%	18.3	13.6-21.7	Normal
%RETIC	%	1.8	-	-
RETIC Aminotransferase	K/ μ L	108.7	10.0-110.0	Normal
RETIC-HGB	pg	20.3	22.3-29.6	Low
WBC	x10 ⁹ /L	7.62	5.05-16.76	Normal
%NEU	%	69.4	-	-
%LYM	%	15.5	-	-
%MONO	%	5.9	-	-
%EOS	%	8.3	-	-
%BASO	%	0.9	-	-
NEU	x10 ⁹ /L	5.29	2.95-11.64	Normal
LYM	x10 ⁹ /L	1.18	1.05-5.10	Normal
MONO	x10 ⁹ /L	0.45	0.16-1.12	Normal
EOS	x10 ⁹ /L	0.63	0.06-1.23	Normal
BASO	x10 ⁹ /L	0.07	0.00-0.10	Normal
PLT	K/ μ L	326	148-484	Normal
MPV	fL	12.6	8.7-13.2	Normal
PDW	fL	15.0	9.1-19.4	Normal
PCT	%	0.41	0.14-0.46	Normal
CREA	μ mol/L	104	44-159	Normal
UREA	mmol/L	4.4	2.5-9.6	Normal
BUN/CREA	-	11	-	-

As of the latest follow-up, the dog is receiving Taheebo supplementation. Taheebo is a polyphenol extract derived from the *Tabebuia avellanedae* tree, native to Brazil. It contains NQ801, an active compound shown to inhibit the proliferation of cancer cells while exhibiting selective toxicity that spares normal cells. This extract is widely utilized as a complementary and alternative therapeutic agent in human oncology [12]. Nephrectomy remains the most effective treatment modality for renal cell carcinoma (RCC) in dogs. Notably, studies have shown that the addition of chemotherapy does not significantly extend survival time compared to surgical treatment alone [3].

4 Conclusion

This case highlights the importance of thorough diagnostic evaluation in dogs presenting with nonspecific clinical signs such as weight loss and anorexia. The detection of a renal mass through physical examination and imaging, followed by confirmatory histopathological analysis, led to the diagnosis of RCC, a rare but aggressive neoplasm in dogs. Surgical intervention via unilateral nephrectomy remains the most effective treatment modality, as demonstrated in this case, resulting in clinical stabilization and improved appetite in the short-term postoperative period. Although the mitotic index indicated a poor prognosis, the patient showed a positive clinical response following surgery. Continued monitoring remains essential due to the high metastatic potential of RCC. This case reinforces the role of early intervention and surgical management in improving the quality of life and potentially prolonging survival in canine patients with renal neoplasia.

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