

Feline kidney disease: its symptoms and management

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Jennifer Wakeling VetMB, BA, CertSAM, MRCVS, explains kidney disease in cats and the important role VNs play in its treatment

KIDNEY disease is one of the most commonly diagnosed diseases in cats, particularly in older animals where it is a common reason for death or euthanasia. As veterinary nurses you will deal with kidney disease on an almost daily basis, whether giving advice on the phone about the importance of pre-anaesthetic blood screening, dealing with fluid therapy and hospitalised patients or, perhaps, doing blood pressure measurements or subcutaneous fluid therapy on outpatients. It is therefore important to have a good understanding of its physiology, pathology and treatments.

Physiology

The kidneys produce urine firstly by filtering blood in the glomeruli, in the outer layer of the kidneys – called the cortex ([Figure 1](#)). This filtrate is passed through the tubules of the kidneys where it is modified to produce urine, which is excreted through the renal pelvis into the renal sinus and then into the ureters. The kidneys are responsible for:

- Maintaining fluid balance and, therefore, blood pressure.
- Electrolyte balance, principally sodium, potassium, chloride and phosphate.
- Acid-base balance (through the secretion of excess acid into the urine).

- Removing toxic waste products.

The most important hormone system controlled by the kidneys is the renin-angiotensin-aldosterone system, or RAS ([Figure 2](#)), which is activated when the blood pressure drops in the glomerulus. The activation of the RAS has many effects, including increased blood pressure, retention of sodium and chloride in the tubules, excretion of potassium and production of a more concentrated urine. In addition, the kidneys have other important roles, such as the metabolism of drugs, maintaining red blood cell production through the secretion of the hormone erythropoietin and maintaining calcium balance partly through conversion of vitamin D to a biologically active form.

Pathology

There are many causes of kidney disease in cats.

These include:

- Congenital problems, such as polycystic kidney disease (common in Persians).
- Kidney or ureteral stones (commonly oxalate).
- Toxins, for example:
 - Melamine; contamination of pet food with this toxin caused a massive food recall in North America last year.
 - Antifreeze (propylene glycol).
 - Plants such as lilies (both flowers and leaves).
 - Many household disinfectants, cleaners and degreasers.
 - Drugs such as gentamycin.
- Infections – this may be an ascending chronic urinary tract infection or a bloodborne pyelonephritis.
- Neoplasia, for example, lymphosarcoma.
- Glomerulonephritis – this is rare but can cause nephrotic syndrome, which can be spectacular as it involves extensive subcutaneous and internal fluid build up. The affected cat may swell up and have puffy legs, tail and face.

In most cases of kidney disease in senior cats, however, the underlying cause is never known. In these cats with chronic kidney disease (CKD) there is irreversible progressive damage throughout the kidneys due to inflammation and fibrosis (chronic interstitial nephritis).

Case history

The following case history does not necessarily represent the “best” way to treat a cat with symptoms of acute kidney failure, but is a real-life case from first opinion practice.

Ciccio is a four-year-old male indoor and outdoor cat that was presented to me with a two-month history of weight loss, a one-week history of poor appetite and a two-day history of severe lethargy. Ciccio is well loved, but lives in a two-cat household, and so the owner was not sure how much he had been eating, what his stools were like or how much he was drinking.

On examination, Ciccio was extremely depressed and weak. He was pale with a normal capillary refill time, dental infection and stinky breath. His eyes were sunken and he had a marked skin tent. He weighed 3.2kg with a body condition score of 2/5.

His heart rate was 150, respiratory rate 40 and his kidneys were slightly tender and irregular. He was very constipated with stool palpable throughout his colon. The bladder was not palpable. His temperature was 37°C.

The following tests were done immediately. The chemistry and complete blood count were sent out:

- Total protein (high) and packed cell volume (PCV; OK).
- Blood urea nitrogen (BUN; very high).
- Blood glucose (OK).
- Doppler systolic blood pressure 95mmHg (low).
- ECG – hyperkalaemia (high potassium) can cause tall, spiky T-waves, but this was not seen in this cat.
- Urinalysis: urine concentration (USG) 1.020 (low), pH 6.0, protein 1+ (not excessive), granular casts, many epithelial cells, no crystals (this is important as many toxins, such as antifreeze, can cause urine crystals), no sign of bacteria or white blood cells.
- Radiography showed large bilateral nephroliths, or kidney stones ([Figure 3](#)).

List of symptoms

- Depression, anorexia and weight loss.
- Severe dehydration with an associated low blood pressure.
- Increased respiratory rate (likely to be due to acidosis).
- Hypothermia (common with kidney disease).
- Abnormal kidney function with the possibility of a severe acid-base and electrolyte imbalance.
- Possibility of anuria (no urine production).

Ideally, Ciccio should have gone to our local emergency service for immediate assessment of electrolytes and blood gas analysis, assessment of urine production and intensive care, but the client did not have a lot of money and was not able to afford the associated additional costs. Therefore, we were faced with treating this cat “blind” for the first 24 hours until we got the serum chemistry results back.

Initial treatment

Ciccio’s initial treatment consisted of the following:

- Rapid rehydration with lactated Ringer’s solution (LRS) intravenously at 75ml per hour (using an IV pump for accuracy) for four hours. As a rule of thumb an animal that is severely dehydrated needs about 10 per cent of its bodyweight ($3.2\text{kg} \times 10 \text{ per cent} = 0.32\text{litre}$ or 320ml) in fluids to correct the dehydration. LRS is a balanced electrolyte solution that has some potassium (usually not enough) and can be helpful for correcting metabolic acidosis, which is common with acute and chronic kidney disease.
- As we were concerned about anuria, we assessed Ciccio hourly for urine production. This could have been done by catheterisation, but we elected to check Ciccio by palpation of the bladder to make sure it was filling, and luckily after the first hour of fluids his bladder started to fill – phew! In addition the heart rate, respiratory rate and general alertness were monitored hourly. Aggressive fluid therapy can cause a too rapid change in blood and oncotic pressure leading to cerebral and pulmonary oedema.
- After four hours Ciccio was a lot brighter and the fluid rate was turned down to three times maintenance (maintenance requirements are roughly 2ml/kg/hour). Cats with kidney disease are often polyuric following rehydration and have increased maintenance requirements.

- The following morning Ciccio had gained 0.3kg, indicating that the rehydration was successful but not excessive; weighing cats on IV fluids is very important to assess the success of treatment.
- Clindamycin (for dental infection) and ranitidine (to control stomach acidity, which can lead to nausea and vomiting) were given. Ciccio was also given a mini-enema to relieve the constipation.

Follow-up care

The chemistry results came back the next day and were pretty bad ([Table 1](#)), with extremely high creatinine and BUN indicating severe kidney disease. We discussed the guarded to poor prognosis and possible euthanasia with the client, but they elected to continue treatment.

It is important to remember that in animals with acute kidney disease some or all of the kidney function can be recovered with aggressive, prompt therapy. Even in cats with chronic or ongoing kidney disease the true extent of the kidney damage cannot be assessed until the cat has been rehydrated, as dehydration will markedly affect the creatinine and BUN concentrations. Young cats are relatively tolerant of moderate CKD and can sometimes live for years with a moderately high creatinine concentration – if you can pull them through the acute phase of their disease.

Ciccio was treated with intravenous fluids, tailored to the specific electrolyte imbalances, for a total of three days before reassessing the creatinine and BUN.

During this time he improved but would not eat, probably due partly to the development of mild uraemic mouth ulcers.

The follow-up chemistry showed a marked decrease in creatinine to 625mmol/l, and after four days of treatment Ciccio started eating.

It is important *not* to offer a prescription kidney diet at this point as this can lead to the development of a food aversion. At this stage offer anything; baby foods, a prescription recovery diet, cooked chicken or fish. Find out what the cat's preferred food type is – sometimes they prefer dry food even when they're sick. Warm the food and hand feed it. Lots of tender loving care at this stage makes all the difference.

Ciccio was discharged after six days with antacids, antibiotics and laxatives ([Table 2](#)). A low-protein, low phosphorus kidney diet was gradually introduced when he was eating well at home. This is the most effective long-term treatment for CKD in cats, and the most important aspect of the diet is the reduced phosphorus level. High phosphorus causes an increased parathyroid hormone concentration that is thought to be damaging to the kidneys in the long term. Unfortunately, due to the nephroliths, the long-term outlook is poor for Ciccio.

Veterinary nurses play a crucial role in the prevention, diagnosis, care and treatment of cats with

kidney disease, from client education about toxins, running the preanaesthetic and diagnostic tests, monitoring and maintaining intravenous fluid therapy and giving the care and general nursing the critically ill kidney patient needs, to understanding the importance of, and participation in, frequent revisits and ongoing care of the CKD cat. The veterinary nurse is an essential part of the integrated team approach to client and patient care.