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**Effects of
PCSO-524[®] (Antinol[®])
Supplementation during
12 Months Follow-up
in 2 Cats with Cystitis
and Chronic Renal
Disease**

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Abstract

Two female cats, spayed, lived in the same house, aged 17 years weighted 2.2 kg and 10 years 4.4 kg, were having chronic renal failure and concurrent cystitis. Senility was suspected etiology of chronic renal failure in the first cat. However, cystitis occurred by an unknown cause. Clinical signs of cystitis included urinary retention, polyuria but low urine output, and hematuria. Chronic renal failure in the second cat was caused by hydronephrosis of both kidneys and bladder stone which was identified by hypoechoic of urinary bladder. The second cat did not show any clinical signs of lower urinary tract. Both cats showed signs of uremic syndrome; polydipsia, polyuria, anorexia, weight loss, coarse hair, depression, halitosis, and vomiting. Both cats were treated with fluid therapy intravenously in the early period and later subcutaneously. The diet was changed to diet formulated for cats with renal failure (Hill's Prescription diet k/d) for both cats. Avastamine (RenAvast™) 1 capsule bid for 1 month, Cystaid® cat (Acetyl D-Glucosamine: NAG125 mg) 1 capsule bid for 1 month, and PCSO-524® (Vetz Petz Antinol®) 1 capsule sid continuously were prescribed for the first cat. The second cat received only PCSO-524® (Vetz Petz Antinol®) 1 capsule sid continuously. The treatment results showed general health improvement, weight gain (2.6 kg and 5.1 kg in the first and second cat, respectively), less hair loss, decreased degree of polydipsia and polyuria, and improvement of blood parameters. No adverse effect of the continuous treatment was found after 18 and 13 months in the first and second cat, respectively.

Keywords:

Antinol®, PCSO-524®, chronic renal failure, cystitis, feline idiopathic cystitis, cat

Case history

Two spayed Domestic short hair cats aged 17 and 10 years were individually taken to veterinary hospital a few months apart. The cats were living together and strictly kept indoors, fed with pellet diet, regularly given spot-on treatment for ectoparasitic and endoparasitic control. The cats were vaccinated only in the early life. Examination for Feline Immunodeficiency Virus/Feline Leukemia Virus (FIV/FelV) using a test kit showed negative result. Symptoms of the first cat included polyuria, urinary retention, low urine output, red and cloudy urine, depression, cachexia, weight loss, coarse hair and vomiting. The cat also had eating and drinking disorder for 2 weeks, halitosis, decayed teeth, gingivitis, and occasionally sticky saliva. The second cat was presented with symptoms included weight loss from 6.3 kg to 4.4 kg in 3 weeks, coarse hair, anorexia, cachexia, polydipsia, polyuria, large urine output, clear urine, halitosis, and vomiting.

Physical examination

Physical examination of the first cat found 2.2 kg body weight, coarse hair, severe hair loss, body condition score (BCS) of 2/5, halitosis, gingivitis, decayed teeth particularly at the lower canine teeth, normal lung and heart sound, normal mucous membrane. Palpation found small urinary bladder and pain when palpated. No abnormal mass was found when palpating the neck. The second cat weighted 4.4 kg, had coarse hair, severe hair loss, body condition score (BCS) of 3/5, dry mucous membrane, normal lung and heart sound, capillary refill time (CRT) less than 2 seconds. Neck palpation did not find abnormal mass.

Diagnostic plan

Tentative diagnosis identified more than 1 disease for the old cats. The most dominant symptoms in the first cat indicated lower urinary tract problem, therefore diagnostic plan was to exam urine, explore urinary bladder using x-ray or ultrasound. Kidney degeneration, chronic renal failure, or endocrine problems commonly found in old cats such as hyperthyroidism were suspected cause of anorexia and weight loss and needed blood test for further diagnosis. The examination in the second cat was focused on systems other than gastrointestinal system since dominant symptoms were weight loss, anorexia, polydipsia, polyuria, and vomiting. Disorders caused by excessive metabolism due to hormone imbalance or loss via kidney and gastrointestinal tract. Diagnostic plan for the second cat therefore included blood test to detect problems hormone function, liver or kidney. Testing for thyroid hormone was not performed at this point since physical examination did not find enlargement of thyroid gland. Blood test, urinary analysis, and ultrasonography examination were selected for the diagnosis.

Laboratory results

The samples were submitted to a private laboratory. Ultrasonography examination was performed at Prasuatorn veterinary hospital, Mahidol University.

Complete blood count and blood chemistry profiles

Creatinine and blood urea nitrogen were high in both cats so azotemia was diagnosed. Increased protein level could be the effect of dehydration or inflammation with thrombocytopenia.

Complete blood count and blood chemistry profiles

Complete blood count and blood chemistry profile of the first cat

Parameter	Reference range	Day 0 (15/07/2015)	Day 3 (18/07/2015)	Month 1 (02/08/2015)	Month 7 (21/03/2016)	Month 16 (04/12/2016)
RBC	5.5-10X10 ⁶ cells/mm ³	9.3	7.5	6.5	6.2	7.3
Haemoglobin	8-15g/dl	14.3	11.8	10.1	10.8	11.7
Haematocrit	24-45%	45.1	36	31	31	37
WBC	5500-19000 cells/mm ³	9600	10600	9600	5400	6300
Neutrophils	33-75%	81	73	73	72	76
Band	0-3%	0	0	0	0	0
Eosinophils	2-12%	4	4	7	10	4
Lymphocytes	20-55%	12	22	19	15	17
Monocytes	1-4%	3	1	1	3	3
MCV	Fl	48	47.9	48	52.6	51.4
MCH	Pg	15.4	15.7	15.5	16.1	16.0
MCHC	g/dl	31.8	32.8	32.3	30.6	31.2
Platelet count	300-600X 10 ³ cells/mm ³	161	188	238	184	128
Icterus index		Normal	Normal	Normal	Normal	Normal
SGPT (ALT)	10-60 unit	31	30	-	53	40
Creatinine	1.3-2.1 mg%	4.5	3.0	2.3	2.3	2.3
Blood urea nitrogen	5-30 mg%	84	41	30	49	47
Plasma protein	6-87.5 mg%	10.6	10.0	NA	NA	NA
Albumin	2.6-3.9 g/dl	3	NA	NA	2.2	2.3
Blood pressure	mmHg	150	NA	140	NA	NA
Body weight	kg	2.2	2.2	2.3	2.4	2.6

Complete blood count and blood chemistry profile of the second cat

Parameter	Reference range	Day 0 (19/10/15)	Day 5 (24/10/15)	Month 3 (6/1/16)	Month 13 (4/12/16)
RBC	5.5-10X10 ⁶ cells/mm ³	9.2	NA	7.94	5.4
Haemoglobin	8-15g/dl	15.9	NA	12.8	9.2
Haematocrit	24-45%	47	NA	40.1	27
WBC	5500-19000 cells/mm ³	13300	NA	9200	11600
Neutrophils	33-75%	75	NA	94	78
Band	0-3%	0	NA	0	0
Eosinophils	2-12%	4	NA	0	1
Lymphocytes	20-55%	18	NA	6	17
Monocytes	1-4%	3	NA	0	4
MCV	Fl	51.6	NA	50	57.9
MCH	Pg	17.2	NA	16.2	17.6
MCHC	g/dl	33.3	NA	32	30.4
Platelet count	300-600X 10 ³ cells/mm ³	172	NA	154	238
Icterus index		Normal	NA	NA	Normal
SGPT (ALT)	10-60 unit	151	NA	77	69
Alkaline phos	1.3-2.1 mg%	16	NA	67	NA
Creatinine	1.3-2.1 mg%	4.3	3.1	2.9	2.6
Blood urea nitrogen	5-30 mg%	112	50	41	40
Plasma protein	6-87.5 mg%	NA	NA	10.2	NA
Albumin	2.6-3.9 g/dl	NA	NA	3.3	NA
Blood pressure	mmHg	150	NA	NA	NA
Body weight	kg	4.4	4.4	4.6	5.1

Remark: CBC-complete blood count, RBC-red blood cell, WBC-white blood cell,g-gram, dl-deciliter, mm3-cubic millimeter, SGPT- serum glutamic pyruvic transaminase, ALT-alanine aminotransferase, MCV-me-ancorpuscular volume, MCH-mean corpuscular hemoglobin, MCHC-mean corpuscular hemoglobin concentration, Fl- femtoliter, pg-picogram, NA-not applicable

Urinalysis results

The urine samples from both cats were collected with cystocentesis technique on the first day of their visits at Prasuatorn veterinary hospital. The urine examination was not repeated throughout the treatment period.

First cat: Date of cystocentesis was 15/07/2015

Supernatant		Sediment	
Color	Yellow	WBC	Yfound
Transparency	Slightly	RBC	-
Specific gravity	1.019	Amorphous	-
pH	5	Mucous	-
Leucocyte	3+	Bacteria: cocci	Found
Nitrogen	-	Bacteria: rod	Found
Protein	-	Fungus	-
Glucose	N	Epithelium/HPF	-
Ketone	-	Cast/LPF	-
Urobilinogen	N	Crystal/HPF	Calcium phosphate
Bilirubin	-		
Erythrocytes	4+		

Results of the second cat

Supernatant		Sediment	
Color	Yellow	WBC	0-1/HPF
Transparency	Slightly	RBC	5-100/HPF
Specific gravity	1.022	Amorphous	few
pH	7	Mucous	-
Leucocyte	3+	Bacteria: cocci	Found
Nitrogen	-	Bacteria: rod	Found
Protein	3+	Fungus	-
Glucose	4+	Epithelium/HPF	Squamous (1-2)
Ketone	-	Cast/LPF	-
Urobilinogen	N	Crystal/HPF	-
Bilirubin	-		
Erythrocytes	4+		
Urine protein	41	Urine creatinine	132.4
Urine protein/ creatinine ratio	0.309		

Remark: HPF-high power field, LPF-low power field, RBC-red blood cell, WBC-white blood cell, N-normal

Ultrasonography results

The first cat:

Due to unavailability of the ultrasonography examination of the first day of the visit, the cat was scheduled for the examination 5 days after cystitis was treated (20/07/15). The result indicated that the cat was having cystitis without cystic calculi, chronic kidney disease, atrophic kidneys, and very limited renal blood flow. Other organs such as liver, gall bladder, and pancreas were normal. The ultrasonography examination was repeated again 9 months later (05/04/2016) to follow up on chronic renal failure. The latter examination found chronic kidney disease, atrophic kidneys, and very limited renal blood flow.

The second cat:

The ultrasonography examination was scheduled 3 months after the first visit (18/01/2016). The result showed chronic kidney disease due to hydronephrosis, slight enlargement of both kidneys at the ureter and renal pelvis, especially of the left kidney, bladder stone that may be sand stone or calculi. The ultrasonography examination had never been repeated.

Treatment plan

The first cat:

Treatment started on 15/07/2015 for chronic kidney disease and cystitis without bladder stone. Fluid therapy was administered intravenously for 1 week, and later subcutaneously every 1-2 days. Medication prescribed included Cystaid® cat (Acetyl D-Glucosamine: NAG125 mg)1 capsule bid, RenAvast™1 capsule bid for 1 month, and PCSO-524® (Vetz Petz Antinol®) 1 capsule sid continuously. The diet was changed to diet formulated for cats with renal failure (Hill's Prescription diet k/d).

The second cat:

The cat had both chronic kidney disease and cystitis. The cystitis was likely to have bladder stone that may have caused pressure and dilatation of ureter and renal pelvis and consequently hydronephrosis. The hydronephrosis could be congenital but the onset had just started. The cat received fluid therapy intravenously. PCSO-524® (Vetz Petz Antinol®) 1 capsule sid was given continuously. The diet was changed to diet formulated for cats with renal failure (Hill's Prescription diet k/d).

Follow-up and Outcome

Early phase

After cystitis was treated and azotemia was controlled, the first cat showed less severity of urine retention, normal urination, and better urine color. The urine retention and hematuria disappeared within 1 week of treatment. Generally, the symptoms were improved and the cat had better appetite and better response. After azotemia was restored to normal condition in the second cat, no symptoms of cystitis were found and the cat had more appetite.

Long-term phase

Fluid therapy was given to both cats every 1-3 days. PCSO-524® (Vetz Petz Antinol®) 1 capsule sid was continued. General health was improved as shiny hair and less hair loss, increased body weight, and less frequency of vomiting, urination, and drinking were observed.

Table showing follow-up timeline and clinical signs of the cats

Timeline	Date	Clinical signs	
		First cat	Second cat
First visit	15/7/2558 19/10/2558	Low output but frequent urination, hematuria, cachexia, coarse hair, hair loss, appetite loss, polydipsia, normal red and white blood cell count, thrombocytopenia, increased creatinine and BUN, low urine specific gravity, bacteriuria, atrophic kidneys, ultrasound images could not distinctively identified medulla and cortex.	Polyuria, polydipsia, weight loss, coarse hair, hair loss, appetite loss, normal red and white blood cell count, increased creatinine and BUN, ultrasound images showed hydronephrosis of both kidneys, bladder stone that may be sand stone or mass, low urine specific gravity, bacteriuria.
Second visit	18/7/2558 24/10/2558	Clear urine, significantly less frequent urination but still polyuria, increased appetite, polydipsia, lower creatinine and BUN.	Less urination output, polyuria, polydipsia, lower creatinine and BUN but still higher than normal.
Third visit	18/7/2558 6/1/2559	Normal red and white blood cell count, thrombocytopenia, lower creatinine and BUN, increased appetite.	Normal red and white blood cell count, thrombocytopenia, lower creatinine and BUN, less polydipsia and polyuria, normal appetite.
Fourth visit	2/8/2558 4/12/2559	Normal red and white blood cell count, thrombocytopenia, stable creatinine and BUN, increased appetite.	Normal red and white blood cell count, thrombocytopenia, lower creatinine and BUN, increased appetite, less hair loss, and smoother hair.
Fifth visit	21/3/2559	Normal red and white blood cell count, thrombocytopenia, stable creatinine, increased BUN, increased appetite, less hair loss and smoother hair, increased body weight.	NA
Sixth visit	4/12/2560	Normal red and white blood cell count, thrombocytopenia, stable creatinine, increased BUN, increased appetite, less hair loss and smoother hair.	NA

Discussion

Chronic renal failure is common in cats and accounts for 13% of mortality in cats over 5 years old. A study of cats mostly older than 10 years in Great Britain found that the disease prevalence was over 30-40% (Sparkes et al., 2016, Suemanotham, 2014). The treatment is aimed to maintain quality of life (QoL). Follow-up is needed every 3-6 months. Due to continuous development of the disease, diet adjustment and supportive treatment is necessary to restore normal body condition, such as management of dehydration, hypertension, anemia, protein loss, appetite loss, vomiting, and urinary tract infection. Urinalysis of both cats found rod and cocci bacteria in urine; however, bacterial culture and antimicrobial sensitivity test were not performed. According to suggestion from ISFM Consensus Guidelines on the Diagnosis and Management of Feline Chronic Kidney Disease (Sparkes et al, 2016), old female cats with chronic kidney disease had 10-30% chance of having bacterial infection of urinary bladder (Litster et al., 2009, 2010, Buffington, 2011). Over 70% of the infections are subclinical and 85% of the infection had change of urine sediment. Antimicrobial use to control the infection should be done with sensitivity test in order to select appropriate agents. Bacterial culture and sensitivity test were not performed for the 2 cats; therefore, antimicrobial treatment was omitted. The risk of having adverse effects, such as more damage to the kidney, caused by using antimicrobial drugs may worsen the chronic renal failure condition. Treatment of cystitis caused by bacteria is treated only when confirmed by bacterial culture or cats have other complications such as fever, abdominal pain, pyuria (>5 WBC/hpf), hematological test indicating bacterial infection (neutrophilia or left shift), or the renal condition is worse without known reasons. Assessment of risk and stage of the disease is essential. In case of subclinical cystitis, the risk of disease development and life threatening is null, so supportive therapy is recommended (Sparkes et al., 2016). There is limitation for selection of NSAIDs in treatment of cats with renal disease due to cyclooxygenase (COX) inhibition action of the drugs. COX and prostanoids from COX is responsible for electrolyte and acid-base balance and glomerular filtration rate of kidney. When COX is inhibited, kidney function could be disturbed. Long-term use of drugs in this group must be cautious and alternatives that have no effects on kidney should be considered (Suemanotham, 2014).

Effectiveness of glycosaminoglycan (GAG) in controlling cystitis in cats is due to the fact that internal surface tissue of lower urinary tract has GAG layer. GAG and GP-51, a specific GAG, are decreased in cystitic cats. Supplementation of GAG therefore restores the balance of tissues lining lower urinary tract (Buffington, 2011).

A study reported that diet formulated for kidney disease had high omega-3 and contributed to longer lifespan of cats. Diets that have high vitamin C and beta carotene are appropriate as well since cats with chronic renal failure have increased oxidative stress.

PCSO-524® (Vetz Petz Antinol®) is extracted from New Zealand Green-lipped mussel (*Perna canaliculus*). It is consisted of fatty acid, which is anti-inflammatory substance, and vitamin E, which is anti-oxidant. The anti-oxidant in vitamin E is 100-200 times more effective than that of EPA, evening primrose oil, and salmon oil. It has been proved that long-term use is safe without any adverse effect therefore appropriate for renal failure cats with oxidative stress and inflammation that regular anti-inflammatory drug is prohibited.

Conclusion

PCSO-524® (Vetz Petz Antinol®) gives satisfactory treatment outcome when used for supportive treatment in cats with chronic renal failure and cystitis, of which the etiology is known or not. The anti-inflammatory and anti-oxidative effects are the key to the success.

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Illustrations

Figure 1. Ultrasonography images of the first cat taken the first time on 20/07/2015 showed atrophic kidneys, indistinctive medulla and cortex, and thickening of urinary bladder wall.

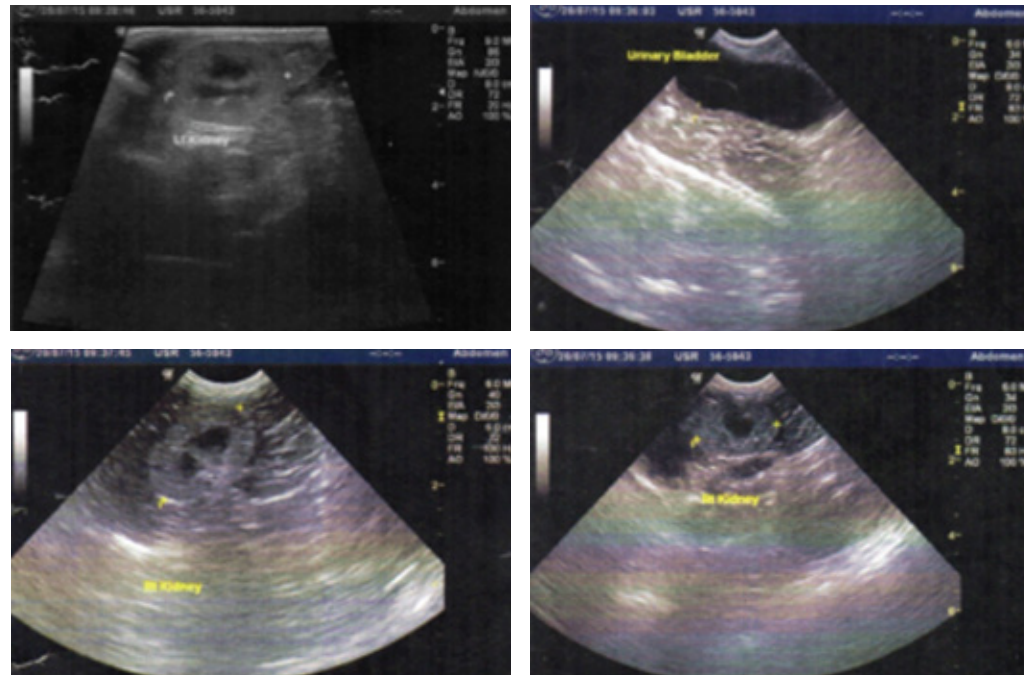


Figure 2. Ultrasonography images of the first cat taken the second time on 05/04/2016 showed atrophic kidneys, limited renal blood flow, and normal urinary bladder.

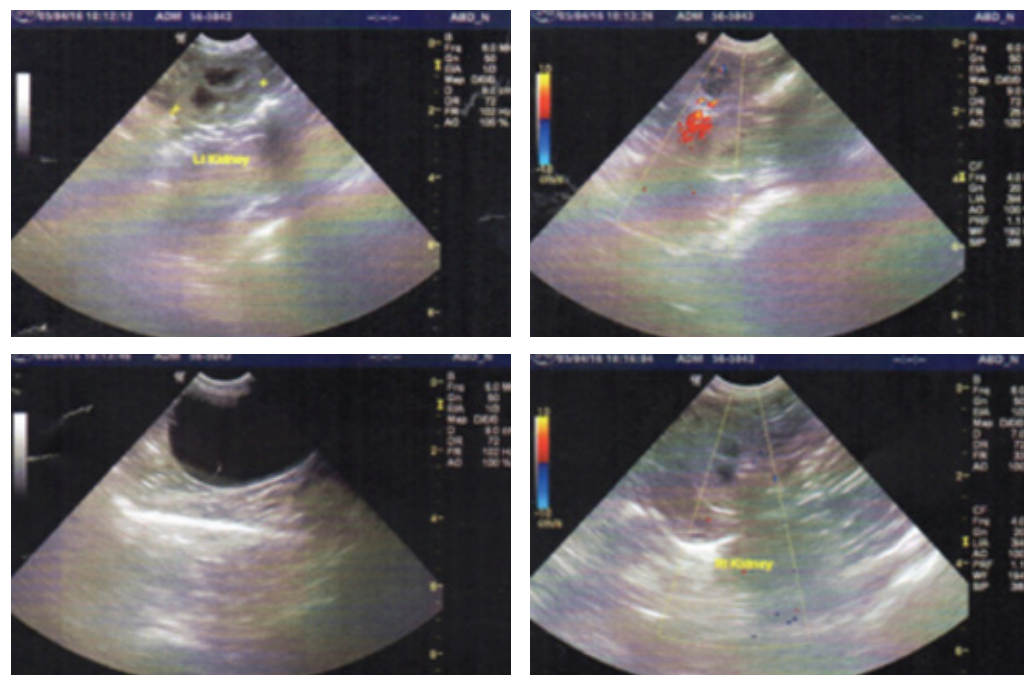


Figure 3. Images of retina of the first cat did not show hypertensive retinopathy due to hypertension caused by chronic renal failure. There was a band lesion previously identified when the cat was 15 years old. The band was likely caused by feline central retinal degeneration or taurine deficiency

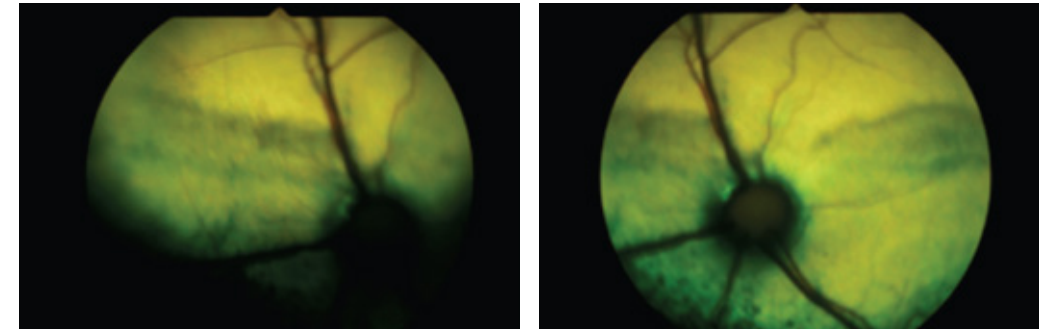


Figure 4. Ultrasonography images of the second cat taken on 18/01/2016 showed hydronephrosis and cystic calculi. The hydronephrosis may be congenital or caused by calculi or sand stone that dilated ureter and renal pelvis and consequently caused hydronephrosis.

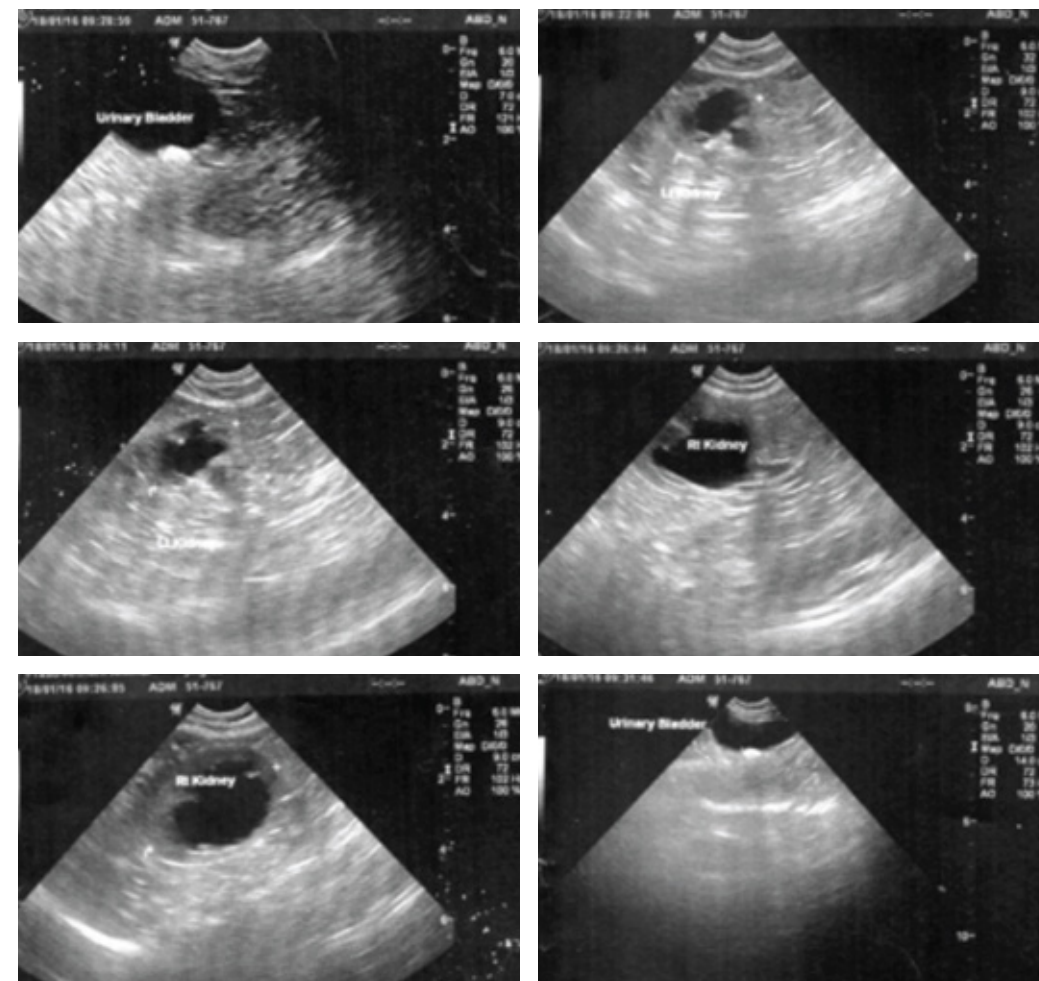
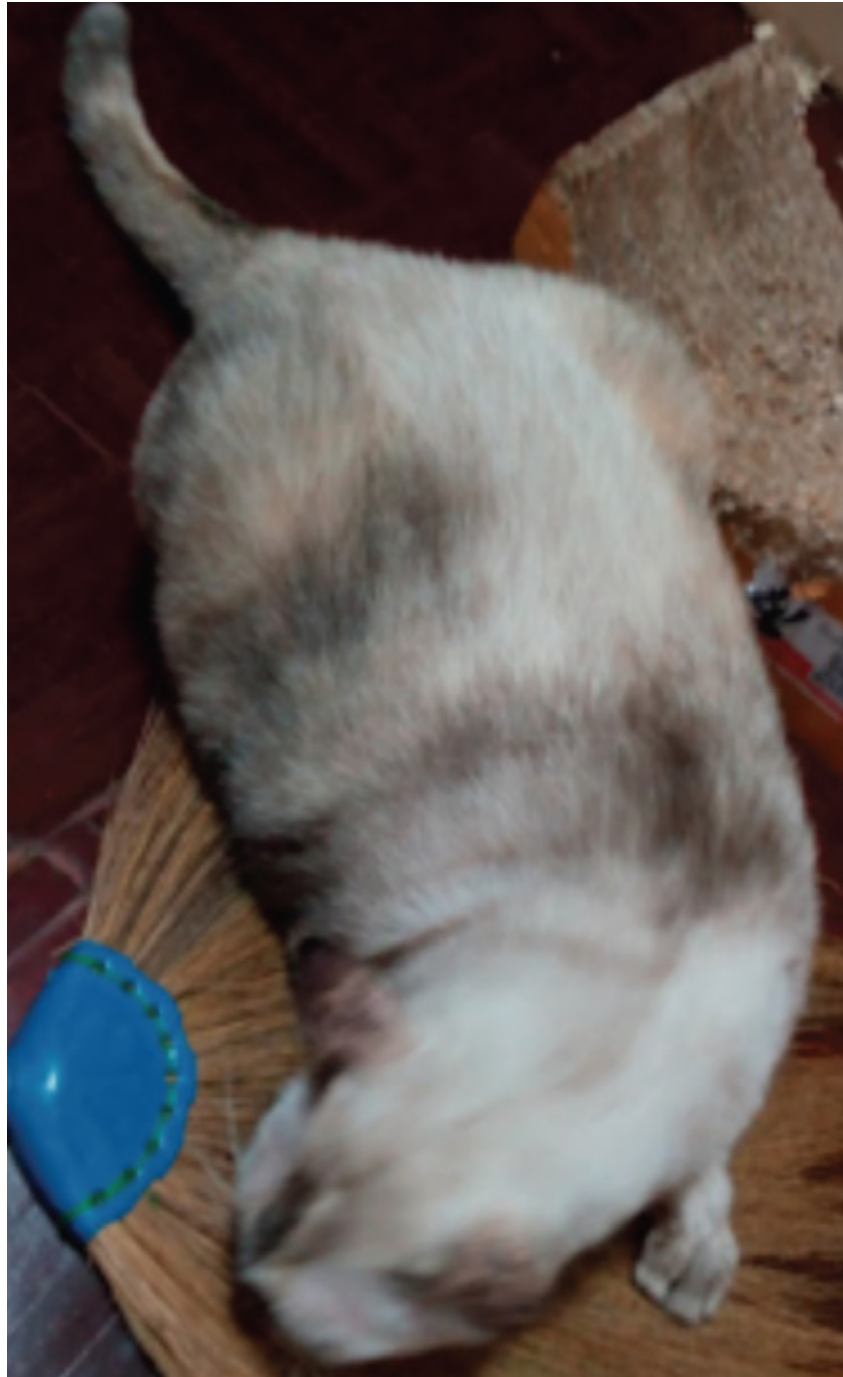


Figure 5. The second cat before onset of the incidence. Body weight was 6.3 kg before the onset and 4.4 kg after the onset. The coarse hair was apparent.





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