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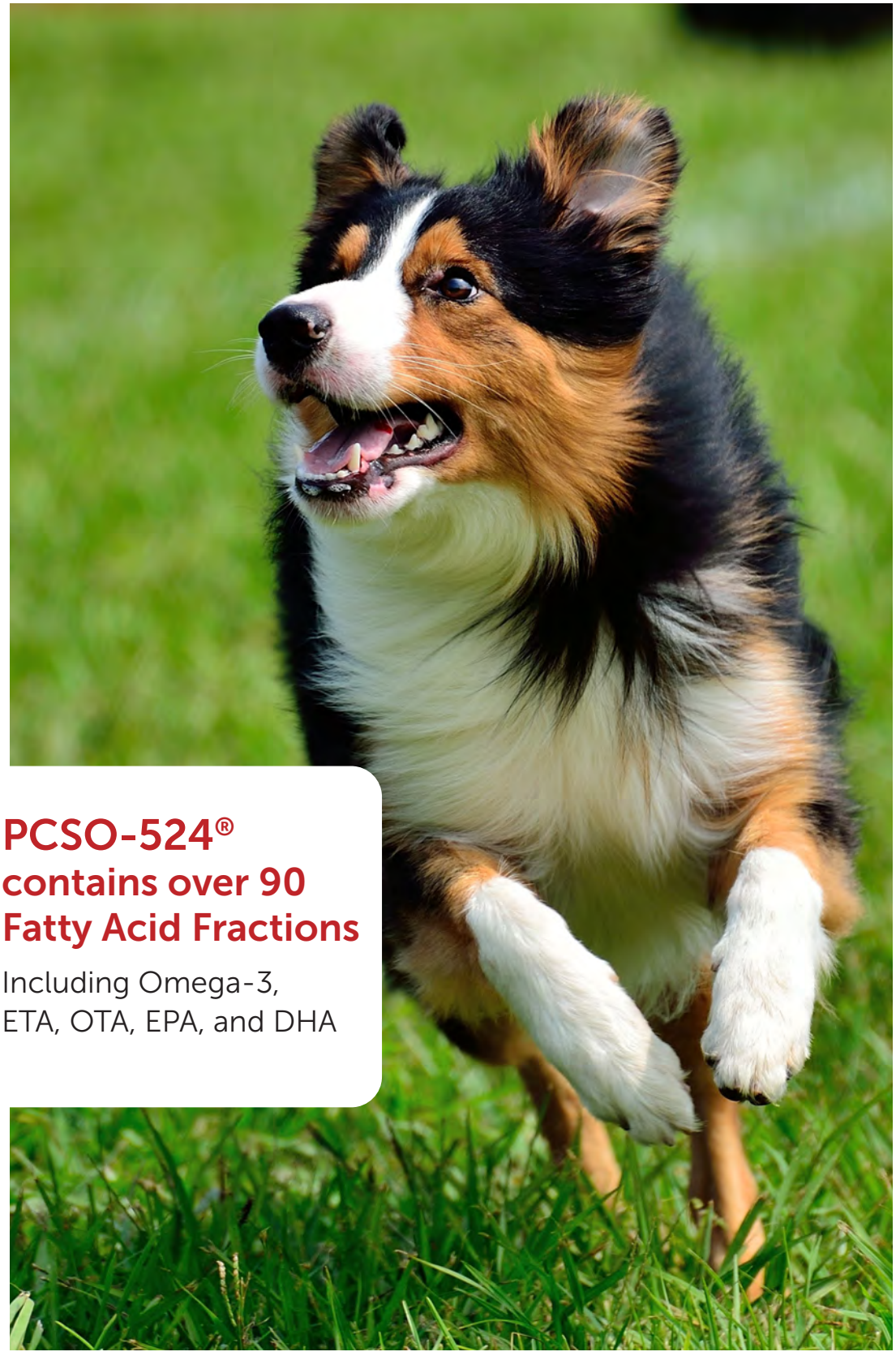

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Case Report

Use of PCSO-524® and Cyclosporin for Treatment of Immune-Mediated Polyarthritis in Dogs

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Case Study Contest 2020

Use of PCSO-524® and Cyclosporin for Treatment of Immune-Mediated Polyarthritis in Dogs

Irin Kwananocha, DVM, Small Animal Hospital, Chulalongkorn University

Abstract

An 8 years old Chihuahua dog was admitted to the Small Animal Hospital at Chulalongkorn University due to signs of depression, lethargy, lameness and joint effusion. Hematological examination and test of synovial fluid indicated Immune-Mediated Polyarthritis (IMPA).

Prednisolone, Gabapentin and Amoxillin-clavulanic acid were prescribed for the treatment.

Abnormally increase of ALT, ALK and AST enzyme was observed 1 week later, therefore, the treatment was changed to Cyclosporin, Gabapetin, and PCSO-524®.

The clinical signs continued to improve after the adjustment of prescription and Cyclosporin and Gabapetin were terminated after 3 and 4 months, respectively.

A follow-up examination at 4 months later showed no signs of lameness and joint effusion and no adverse effects caused by the long-term use of PCSO-524®.

The success of **IMPA treatment** is a result of rapid diagnosis and appropriate treatment protocol. Follow-up for treatment evaluation is necessary during the treatment course in order to reduce the impact on health and minimize the medication dosage without risk of causing adverse effects or recurrence of the disease.

Keywords: Cyclosporin, dog, Immune Mediated Polyarthritis, PCSO-524

Introduction

Immune-Mediated Polyarthritis (IMPA) is a common disease in dogs. Clinical signs are various and include walking reluctance, abnormal walk gesture, lameness, joint effusion, and joint pain that usually occurs at multiple sites. Stilted gait is common and sometimes fever, lethargy, loss of appetite, vomiting, and diarrhea can be found. Incidence of IMPA occurs in dogs regardless of their breed, age, gender and size.

IMPA is caused by accumulation of immune complex in the articular membrane which results in inflammation and increased migration of neutrophils into the joints[1]. IMPA is categorized as primary and secondary IMPA.

Primary IMPA is an idiopathic disease and secondary IMPA is caused by external stimulant, for example, immunological response to vaccine or medication, blood parasitic infestation, diseases of gastrointestinal tract, and tumors.

Preliminary diagnosis of IMPA is based on case history, physical examination, hematological test, and examination of synovial fluid. Dogs with IMPA usually have synovial fluid that contains protein higher than 2.5 g/dl, white blood cells greater than 3,000 cells/µl of which more than 10% are neutrophils, and shows negative result on bacterial culture (2).

Recommendation for treatment of IMPA includes **steroid use for immune suppressant**, for example, prednisolone, or immunosuppressant drugs such as cyclosporin and azathioprine. Complications that are side effects of the medication must be monitored closely. When the clinical signs are improved, the medication dosage should be tapering down. For treatment of secondary IMPA, **elimination of the stimulating factors** is crucial for treatment success. Medication for pain relief is essential in dogs that show signs of painful joints. Pain control drugs that can be used with immunosuppressant steroid are, for example, opioids, gabapentin and amantadine [2].

PCSO-524® is extracted from New Zealand Green Lipped Mussel that is an enriched source of **polyunsaturated omega-3 fatty acids (n-3 PUFAs)** which consisting of eicosatetranoic acid (ETA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). The fatty acids have anti-inflammatory effects as a result of ability to **block lipoxygenase (LOX) and cyclooxygenase (COX) pathway** by decreasing leukotriene and prostaglandin production [3, 4].

Effect of n-3 PUFAs is to reduce concentration of omega-6 fatty acid, as a result, the inflammatory action is prohibited. The effect is caused by reduction of eicosanoids, such as Prostaglandin E2, leukotriene B4, leukotriene C4 and thromboxane A2, which are derived from omega-6 and act as proinflammatory mediator in arachidonic pathway. Eicosanoids that are derived from omega-3 fatty acid has **anti-inflammatory effect** since they can replace eicosanoids derived from omega-6 and thus reduces the mechanism of inflammation. Supplementation of omega-3 therefore has anti-inflammatory action [5].

The objectives of this study were to determine the effect of PCSO-524® when used with immunosuppressant drug for treatment of joint pain and arthritis caused by IMPA and the potential for PCSO-524® to shorten the duration of pain relief and immunosuppressant drug use.

Case History

An 8 years old Chihuahua dog with body weight 4.2 kilograms was referred to the Surgery unit of Small Animal Hospital at Chulalongkorn University for treatment of patella luxation.

The dog showed signs of depression, lethargy, fever, anorexia, and intermittent lameness of the left leg for 2 weeks. The lameness was gradually deteriorated to the point that the dog was reluctant to walk. The dog was previously treated with non-steroidal anti-inflammatory drug (NSAIDs) but the signs were not improved. Abnormality of gastrointestinal tract was not detected. There was no history of vaccine or medication prior to the incidence.

Physical examination

The dog was depressed but responded to environmental stimuli.
The examination found normal color of mucous membrane and 103.6 oF body temperature.
All 4 legs were able to bear weight, but the walking was unsteadily with **lameness score 3/5** (Table 1).

Plantigrade stance was detected from both forelimbs. Palpation identified joint effusion at carpal, tarsal and stifle joint on both sides. **Medial patella luxation** (MPL) scored 2/4 with positive drawer sign was detected on both sides and the pain score was 2/4 (Table 2).

Cervical and lumbar stiff with 2/4 pain score was found and there was no neurological disorder. Radiographic images showed MPL on both sides (Figure 1) but did not find any disorder of cervical and thoracic vertebrae (Figure 2).

Table 1. Lameness score 0-5 (6)

Lameness score	Signs
0	Normal walk
1	Slightly lame
2	Apparent lameness but weight bearing is maintained
3	Severe lameness but weight bearing is maintained
4	Occasionally avoid weight bearing on affected leg
5	Always avoid weight bearing on affected leg

Table 2. Pain score 0-4 (6)

Pain score	Signs
0	No sign of pain during palpation
1	Slight pain during palpation
2	Moderate pain during palpation
3	Severe pain during palpation
4	Unwilling to allow palpation

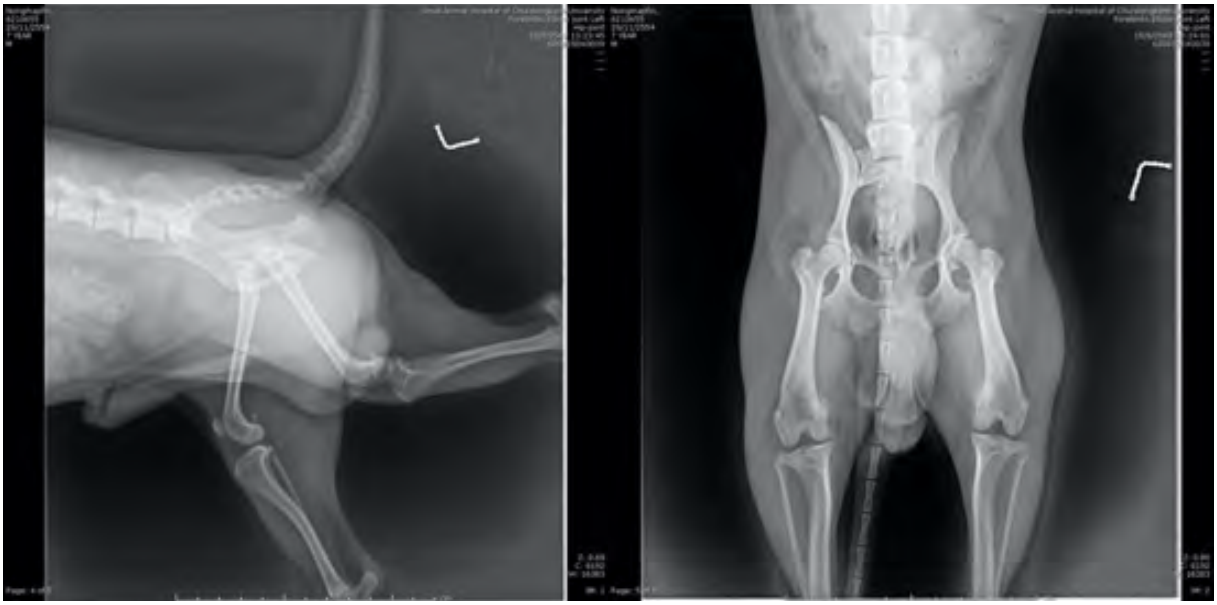

Figure 1. Radiographic images from ventrodorsal view
showing patella luxation towards medial trochlear groove (medial patella luxation) on both sides

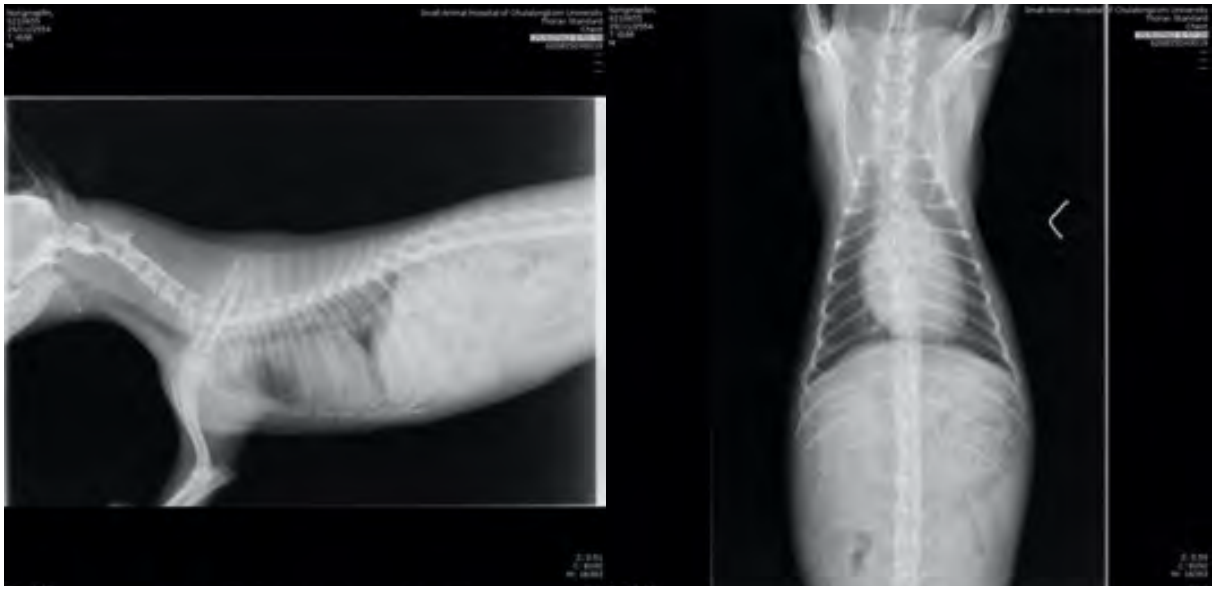

Figure 2. Radiographic images from lateral ventrodorsal view found no disorder of cervical and thoracic vertebrae

Diagnosis and Results

Hematological test found high number of white blood cells (35,120 cells/µl) and high level of alkaline phosphatase. (ALK; 440 IU/Ls) (Table 3) Examination of synovial fluid detected high number of neutrophils, lymphocytes, and macrophages, 6.2 g/dl protein, and 1.033 specific gravity (Table 3).

Bacterial culture and **minimal inhibitory concentration test (MIC)** did not find bacterial growth which indicated that the fluid was non-septic exudate. From history, physical examination, hematological test, examination of synovial fluid, and radiographic images, the dog was diagnosed with **primary non-erosive immune mediated polyarthritis.**

Table 3. Hematological test results during the treatment course

Date dd/mm/yy	**23/08/19**	**06/09/19**	**20/09/19**	**04/10/19**	**18/10/19**	**01/11/19**	**29/11/19**
RBC (106/µL)	5.43	6.25	6.71	6.86	7.41	7.73	7.67
Hb (g/dl)	12.9	14.9	15.4	15.4	16.9	18.5	17.8
Hct (%)	34.5	41	41.9	44.6	49.9	52.7	49.9
MCV		66.1	62.2	65.1	67.3	68.2	65
MCH		24	22.8	22.5	22.9	23.9	23.2
MCHC		36.2	36.7	34.5	33.9	35.1	35.8
Platelet (103/µL)	260	478	802	712	675	734	484
WBC (103/µL)	35.12 *	18.36 *	12.15	11.79	11.52	10.02	9.16
AST (Units)		101 *					
ALT (Units)	42	519 *	219 *	71	53	31	33
ALK (IU/Ls)	440 *	2538 *	1021 *	269 *	118 *	86	84
BUN (mg%)	13	30.2	23.9	23.3	23.6	19.4	18.6
Creatinine (mg%)	0.8	0.6	0.4	0.5	0.5	0.6	0.6
Total protein (g%)	6.6			7.2	6.8	7.9	6.8
Albumin (g%)				4.1	3.8	4	3.6
SNAP 4Dx	Negative						
Fluid analysis 29/08/19							
TNCC			Undifferentiated cells/µl				
Protein			6.2 g/dl				
Specific Gravity			1.033				
Microscopic examination			Numerous neutrophils, lymphocytes, and macrophages				
Fluid analysis			Exudate				

Note: * Indicates abnormal values

Treatment and Follow up

Prescription during the first week of treatment was

Prednisolone	0.6 mg/kg bid pc
gabapentin	10 mg/kg sid pc
samylin	1 tablet sid ac
amoxicillin-clavulanic acid	20 mg/kg sid ac

Later it was found that enzyme levels were higher than normal ranges; (Table 3) 101 units of aspartate aminotransferase (AST), 519 units of aspartate aminotransferase (ALT), and 2,538 IU/Ls of Alkaline Phosphatase (ALK), therefore **prednisolone was terminated.**

The new prescription then included

cyclosporine	6 mg/kg bid ac
gabapentin	10 mg/kg bid pc
same 90 mg	1 tablet sid ac
PCSO-524®	1 capsule bid pc for 1 month

The clinical signs were improved as decrease of lameness score, pain score and joint effusion was observed.

The following prescription maintained the level of gabapentin but cyclosporine was 25-50% reduced every 2-4 weeks and PCSO-524® was reduced to 1 capsule per day.

Cyclosporin and gabapentin was terminated in the third and fourth month of the treatment, respectively. **Only PCSO-524® was continued for the following 4 months** and no recurrence of lameness or joint effusion was observed.

Table 4. Medication and dosage during the treatment and follow up

Date dd/mm/yy	Medication and dosage	Clinical signs
29/08/19 (VDO 1, 2)	- Prednisolone 0.6 mg/kg bid - Gabapentin 10 mg/kg bid - Amoxicillin-clavulanic acid 20 mg/kg bid - Samylin 1 capsule sid	- depress, anorexia, fever 103.6 °F - lameness score 3/5, pain score 2/4 - joint effusion at both carpal, hock and stifle joint
06/09/19	- Cyclosporin 6 mg/kg bid * - PCSO-524® 1 capsule bid * - Gabapentin 10 mg/kg bid - Same (90) 1 tablet sid *	- responsive, loss of appetite, no fever - lameness score 3/5, pain score 1/4 - joint effusion at both carpal, hock and stifle joint
20/09/19 (VDO 3)	- Cyclosporin 6 mg/kg bid - PCSO-524® 1 capsule bid - Gabapentin 10 mg/kg bid - Same (90 mg) 1 tablet sid	- alert, good appetite - lameness score 2/5, pain score 0/4 - joint effusion at both carpal, hock and stifle joint
04/10/19	- Cyclosporin 4 mg/kg bid * - PCSO-524® 1 capsule sid * - Gabapentin 10 mg/kg bid - Same (90) 1 tablet sid	- alert, good appetite - lameness score 2/5, pain score 0/4 - joint effusion at both carpal and stifle joint
18/10/19	- Cyclosporin 6 mg/kg sid * - PCSO-524® 1 capsule sid - Gabapentin 10 mg/kg bid - Same (90) 1 tablet sid - Metronidazole 15 mg/kg bid for 7 days *	- alert, good appetite, diarrhea - lameness score 2/5, pain score 0/4 - joint effusion at both carpal and stifle joint
01/11/19 (VDO 4)	- Cyclosporin 6 mg/kg q 48 hr * - PCSO-524® 1 capsule sid - Gabapentin 10 mg/kg bid	- alert, good appetite, no diarrhea - lameness score 1/5, pain score 0/4 - joint effusion at both carpal and stifle joint
29/11/19	- Cyclosporin 2.4 mg/kg q 48 hr * - PCSO-524® 1 capsule sid - Gabapentin 10 mg/kg bid	- alert, good appetite - lameness score 1/5, pain score 0/4 - joint effusion at both stifle joint
13/12/19	- Cyclosporin 2.4 mg/kg q48hr * - PCSO-524® 1 capsule sid - Gabapentin 10 mg/kg sid *	- alert, good appetite - lameness score 0/5, pain score 0/4 - joint effusion at left stifle joint
27/12/19 (VDO 5)	- PCSO-524® 1 capsule sid - Gabapentin 10 mg/kg sid	- alert, good appetite - lameness score 0/5, pain score 0/4 - minimal joint effusion at left stifle joint
29/1/20 (VDO 6)	- PCSO-524® 1 capsule sid	- alert, good appetite - lameness score 0/5, pain score 0/4 - minimal effusion at left stifle joint
26/2/20 (VDO 7)	- PCSO-524® 1 capsule sid	- alert, good appetite - lameness score 0/5, pain score 0/4 - No joint effusion
5/5/20 (VDO 8)	- PCSO-524® 1 capsule sid	- alert, good appetite - lameness score 0/5, pain score 0/4 - No joint effusion

Note: * indicates adjustment from the previous prescription

Discussion

Immune mediated polyarthritis is commonly found in small and large breeds of dogs at all ages. The symptoms are various that the diagnosis usually takes some time and thus delays the treatment [2]. In this case at the early stage of the disease, only intermittent lameness of the left hind limb was observed and patella luxation was identified as the cause of lameness. When the dog did not respond to treatment with NSAIDs and joint effusion was additionally shown, further diagnosis was then performed.

The examination of synovial fluid was able to identified **IMPA** as the true cause of the symptoms. Treatment of IMPA usually begins with steroid to suppress the immune for at least 30 days or until the symptoms are improved then gradually taper the dosage of steroid.

Immunosuppresive drugs such as cyclosporine and azathioprine can be used in conjunction with steroid to control the symptoms and to shorten the duration of steroid administration [2]. However, long-term use of steroid and immunosuppressive drugs can cause adverse effects such as **kidney failure, liver failure, gastrointestinal tract ulcer, vomiting, and diarrhea** [7]. We found that ALT, ALK, and AST had increased to abnormal level in this dog after only 7 days of prednisolone 0.6 mg/kg bid administration. So prednisolone was immediately terminated and replaced with cyclosporine, which also raised concern on the long-term use effect.

PCSO-524® was then prescribed in conjunction with cyclosporine and gabapentin to reduce inflammation and pain and to minimize the duration of cyclosporine use and prevent recurrence of the disease.

The dog showed sign of diarrhea after 6 weeks of cyclosporine treatment, so the dosage was 50% reduced and metronidazole was additionally introduced when gabapentin and PCSO-524® dosage remained constant. The diarrhea stopped within 7 days and the joint effusion was gradually improved that we were able to terminate cyclosporine and gabapentin in the third and fourth month after the treatment, respectively. The recurrence of IMPA was not observed at the follow-up 4 months later.

Conclusion

The study had shown that PCSO-524® can be used in conjunction with cyclosporine and gabapentin for treatment of non-erosive IMPA. **It is effective against joint pain, arthritis and muscle inflammation.**

The clinical signs continued to improve even when dosage of cyclosporine and gabapentin was reduced and eventually terminated.
The follow-up at 4 months later showed no recurrence of lameness and joint pain from IMPA and lack of adverse effects for the long-term use of PCSO-524®.

Acknowledgement

The author would like to thank Small Animal Hospital, Chulalongkorn University and colleagues who contributed to the treatment of the case dog.

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อันดับที่ 3
อันดับที่ 1


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อันดับที่ 1

Case Report

Use of PCSO-524® for Supplementary Treatment of Protein Losing Nephropathy in Animals

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Antinol® (PCSO-524®)
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Use of PCSO-524® for Supplementary Treatment of Protein Losing Nephropathy in Animals

Kornkaew Thongtang [1], Pornphan Sukanan [1],
[1] Suvarnachad Animal Hospital, Saphan Sung

Abstract

An intact male Shih Tzu dog weighed 5.8 kilograms was referred to Suvarnachad Animal Hospital with signs of polydipsia, polyuria, edema and ascites due to accumulation of fluid in the abdominal cavity.

Biochemical tests found hypoalbuminemia, hyperglobulinemia, hypercholesterolemia, increased urine protein creatinine ratio (UPC) to 5.88 and no signs of inflammation or infection of the urinary tract.

Protein losing nephropathy from glomerular disease was diagnosed based on the biochemical indicators. Medication was given to the dog in order to control kidney damage and minimize the clinical symptoms.

Anti-proteinuric drug, for example ACE inhibitor to reduce blood pressure, was particularly selected for the treatment in conjunction with prednisolone and PCSO-524® as supplementary treatment.

During the 10 months follow up, the dog showed improvement of clinical symptoms, no edema, lack of accumulation of fluid in abdomen cavity, and serum albumin that was increased to normal level.

Keywords: Anti-proteinuric drug, hypoalbuminemia, PCSO-524, protein losing, nephropathy, UPC

Introduction

Protein losing nephropathy is caused by damage of glomerulus and, as a result, excess amount of serum protein leaks from the filtration, especially albumin, and the reabsorption by proximal convoluted tubules is insufficient. The glomerulus and tubule cells are damaged leading to chronic renal failure eventually.

The main etiology of protein losing nephropathy is immune-complex glomerulonephritis, of which influential factors include infection, such as bacterial infection, blood parasite and heart worm infestation, which are common in young to middle age animals and cancer, particularly in senile animals. The second most common etiology of the disease is amyloidosis that is caused by accumulation of **amyloid A protein from chronic inflammation** and usually congenital in Shar-pei dogs. The most accurate diagnostic method is renal biopsy (Vaden, 2016).

Clinical signs of the disease depend on the level of proteinuria and sometimes not specific, for example, loss of body weight and lethargy. If the loss of protein continues to be more than 3.5 grams per day, the symptoms are more specific and called nephrotic syndrome, which include 4 clinical symptoms; proteinuria, hypoalbuminemia, ascites or edema when serum albumin is less than 1.5 mg/dl, and hypercholesterolemia. The proteinuria is indicated by the ratio of urine protein and creatinine higher than 0.5 and classified as glomerular origin when reached 2.0.

More than 80% of dogs with protein losing nephropathy, with or without azotemia, usually show sign of **hypertension**.

Treatment of protein losing nephropathy is consisting of finding and treating underlying causes, restriction from high protein diet, and administration of antiproteinuric drugs, such as ACE inhibitors, angiotensin receptor blockers, and aldosterone receptor blocker. A success in reducing proteinuria, will also retard the deterioration of renal function.

Supplementation with fatty acids in omega-3 group is proved to be effective in humans and animals for prevention of damage to glomerular tubules and delay the progression of **end stage renal disease**. It also works with omega-6 fatty acids to increase glomerular filtration (GFR), decrease cholesterol level with anti-oxidative and anti-inflammatory effects, control hypertension, and reduce protein loss in urine (Broen et al., 2013, Grant and Forrester, 2001 and Grauer, 2005).

Vetz Petz® Antinol® was selected for supplemental therapy in this study since its active ingredient, PCSO-524®, extracted from greenshell mussel (GSM) or green lipped mussel (GLM), Perna canaliculus, from New Zealand, is consisting of more than 90 natural fatty acids. **The essential elements that are effective against inflammation are omega-3 fatty acids, EPA and DHA to be specific**, unsaturated fatty acids from olive oil that are mediator for transportation of PCSO-524® to duodenum and inhibition of the action of gastric enzymes, and vitamin E (tocopherol) that has anti-inflammatory effect (Eason et al., 2018 and Brown et al., 1998).

Case History

A 9 years old, intact male Shih Tzu dog weighed 5.8 kilograms with 7/9 body condition score was admitted to Suwanachad Animal Hospital with history of anorexia, lethargy, polydipsia, polyuria, and abdominal enlargement for 10-14 days. The dog showed no signs of vomiting, diarrhea, and coughing.

Physical examination

Upon examination, the dog was alert with 101 °F body temperature, pink mucous membrane, less than 2 seconds of capillary refilling time.

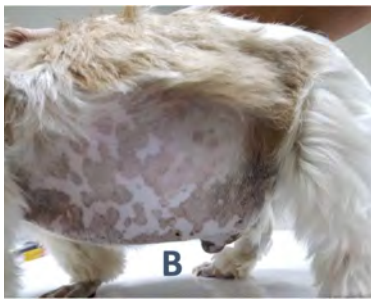

Figure 1A and 1B. The dog with abdominal enlargement and edema

Normal heart and lung sound, 140 beats per minute heart rate, 30 per minute respiratory rate.

No sign of dehydration, abdominal enlargement, and peripheral edema of both hind limbs, ventral abdomen and scrotal sac (Figure 1A and 1B)

Diagnosis and Results

Laboratory results from complete blood count and serum biochemistry profiles and urinalysis (Table 1A and 1B) revealed hypoalbuminemia, hypercholesterolemia, and above normal level of urine protein creatinine ratio.

Table 1A. Blood chemical and hematological test results

CBC	Normal Value	Results
RBC (106/µl)	5.5-8.5	7.92
Hb (g/dl)	10-20	17.6
PCV (%)	35-57	50
MCV (Fl)	66-77	63.3
MCH (g/dl)	19.9-24.5	22.2
MCHC (g/dl)	31-34	35
TP (g/dl)	6-8	6
WBC (µl)	5,500-17,000	15,470
Neutrophil (µl)	3,000-11,500	13,150
Eosinophil (µl)	100-1,250	154
Lymphocyte (µl)	1,000-4,800	2,165
Monocyte (µl)	150-1,250	-
Platelet (105/µl)	2-5	8.13
Blood parasite	NF	NF
SNAP 4DX	Negative	Negative
Blood chemical Profiles	**Normal Value**	**Results**
SGPT (U/l)	17-78	36
ALP (U/l)	47-254	211
Creatinine (mg/dl)	0.4-1.4	0.6
BUN (mg/dl)	9.2-29.3	20
Albumin (g/dl)	2.6-4.0	1.5
Globulin (g/dl)	1.7-3.8	4.5
Cholesterol (mg/dl)	111-312	>450
Sodium (mEq/l)	141-152	144
Potassium (mEq/l)	3.8-5	4.9
Chloride (mEq/l)	102-117	109
Glucose (mg/dl)	80-180	102

Table 1B. Urinalysis results

Parameters	Results
Transparency	Clear
Specific gravity	1.032
pH	6.5
WBC	Negative
RBC	Negative
Nitrite	Negative
Protein	+3
Glucose	Negative
Urobilinogen	Negative
Bilirubin	Negative
Urine C/S	No Growth
UPC	5.87 (void 24 h)

Abdominal Radiographic findings

Radiographic images in right lateral recumbency (Figure 2A) and ventrodorsal view (Figure 2B) showed normal sized heart and **the vertebral heart score (VHS) was 10.**

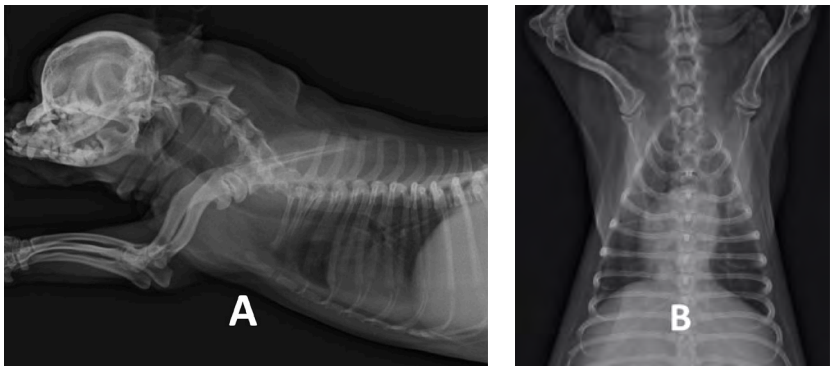

Figure 2. Radiographic images in lateral view (Figure 2A) and ventrodorsal view (Figure 2B)

Abdominal Ultrasonographic findings

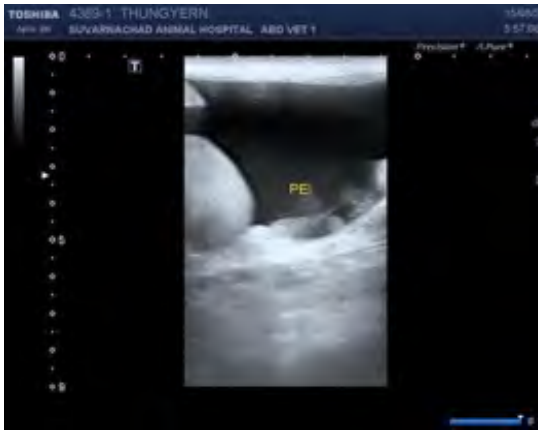

Figure 3. Abdominal Ultrasonography revealed large volume of anechoic peritoneal fluid

Figure 4. Serous fluid from abdominal cavity

Large amount of fluid accumulated in abdominal cavity was found from ultrasonography examination without other signs of abnormalities. (Figure 3)

Examination of ascitic fluid found transudate with protein level less than 0.2 g/dl and 50 cells/µl of red and white blood cells (Figure 4).

The dog was diagnosed with protein losing nephropathy caused by glomerular disease without azotemia.

Treatment

Since the true cause of the disease is unidentified, **supportive therapy** is designed for the treatment. The regular diet was replaced with diet formulated for dogs with kidney disease.

PCSO-524® (Vetz Petz® Antinol®) 1 capsule every 24 hours, and benazepril 0.5 mg/kg were prescribed to reduce urinary loss of protein. Additional medications, clopidogrel to prevent thromboembolism and amino acid to increase serum albumin, were given. Therapeutic paracentesis is employed to reduce ascitic fluid and 2 mg/kg every 24 hours of spironolactone, a diuretic drug, was given.

During the first month of treatment, the dog did not show any improvement since serum albumin was still under 1.5 mg/dl, as a result, signs of edema, ascites, and hypovolemia still persisted. Colloid used for intravenous fluid resuscitation was 17 grams of human serum albumin to maintain cardiovascular volume and blood pressure.

PCSO-524® (Vetz Petz® Antinol®) was increased to 2 capsules every 24 hours and amlodipine was given at 0.5 mg/kg every 24 hours to control hypertension.

To reduce inflammation of glomerulus, prednisolone 0.5 mg/kg every 24 hours was prescribed for 2 weeks, and then tapered off to 0.25 mg/kg every 24 hours and 0.25 mg/kg every 48 hours, respectively.

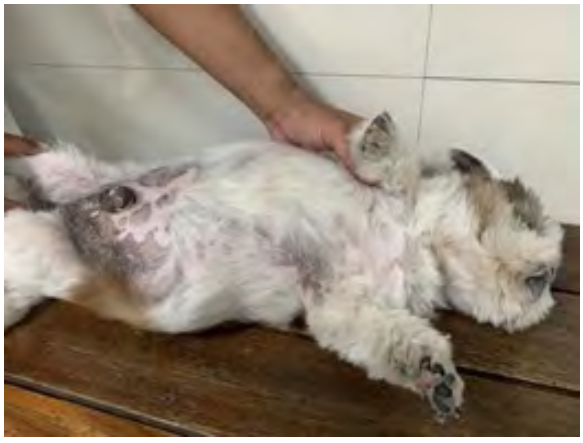

Figure 5. The dog showed no sign of clinical abnormality after 10 months of treatment

Treatment Follow up

Physical examination to evaluate response to the treatment found that clinical signs had improved and the abdominal distension and ascites were disappeared after 3 months of the treatment (Figure 5).

Blood chemistry test showed that serum albumin was more than 2.5 mg/dl after 4 months and urine protein creatinine ratio (UPC) was less than 50% of the starting value after 10 months. There was no increase of creatinine and potassium above the normal level during 10 months follow up (Table 3).

		Month of follow up					
Parameter	**1st visit**	**1**	**2**	**3**	**4**	**6**	**10**
Albumin (g/dl)	1.5	1.4	1.7	2.3	2.7	2.3	2.4
Creatinine (mg/dl)	0.6	0.3	0.3	0.4	0.6	0.4	0.5
K (mEq/l)	4.9	-	4.5	-	-	4	4.8
UPC	5.87	8.7	13	11.9	6	4	2.8

Table 3. Blood chemistry test results prior to and after the treatment

Discussion

Diagnosis of protein losing nephropathy (PLN) is based on evaluation of urine protein creatinine ratio (UPC), which obtained from at least 2-3 sample collections within 24 hours.

Continuing loss of protein and UPC greater than 2 indicates the damage of glomerulus.

Glomerular disease is categorized by the severity into 3 stages;
Tier I) Proteinuria is found without hypoalbuminemia or azotemia,
Tier II) Proteinuria is concurrently found with hypoalbuminemia but not azotemia,
and **Tier III)** Proteinuria, hypoalbuminemia and azotemia are found.

This study case was in Tier II since the dog showed proteinuria, hypoalbuminemia and without azotemia. The treatment and prognosis is similar to that of chronic kidney disease.

The study case was additionally diagnosed with chronic inflammation from increased number of platelets and the presence of hyperglobulinemia. Standard treatment was employed to reduce protein loss and the damage of glomerular and tubular tissue, prevention of complications associated with glomerulopathy, and delay the progression of end-stage renal failure.

Renal diet is considered a high quality, reduced protein content diet formulation is used to maintain adequate calorie and reduce proteinuria with low sodium and phosphorus in order to control systemic hypertension and reduce renal damage progression, and also contains omega-3 fatty acids, which is proved to be effective for proteinuria reduction (Grauer, 2005).

The antihypertensive drugs effective for reduction of protein loss are **ACE inhibitors**, such as enalapril, benazepril and ramipril, of which adverse effects that should be concerned include dehydration that could lead to hypotension, hyperkalemia, and high creatinine (Vaden, 2016).

There are demonstrations of **omega-3 fatty acid supplementation in dogs**, for example, EPA and DHA that are elements of GSM. GSM inhibits thromboxane that induces agglutination of platelets at the glomerular capillary arterioles and causes glomerulonephritis (Grauer, 2005). The amount of protein leak at glomerulus exceeding the limit that convoluted tubules can absorb causes oxidation of lipoprotein transferrin and other proteins, which then causes free radicals and damage to glomerular cells and surrounding tissues.

Omega-3 fatty acids have anti-oxidative and anti-inflammatory effects since they inhibit cyclooxygenase (COX) and lypo-oxygenase (LOX) function, therefore damage and inflammation of cells are controlled (Grauer, 2002).

The other effects include decreasing level of cholesterol and triglyceride, which is caused by increasing lipoprotein from the liver to compensate the loss of albumin when PLN occurs (Vaden, 2016).

The previous studies had proved that omega-3 fatty acids are effective against inflammation and proteinuria caused by glomerulonephritis.

The recommended dosage is 250-500 mg of Omega-3 fatty acid/kg every 24 hours according to Brown et al. (2013).

A study by Lascells et al. (2010) found that GLM contained only little amount of omega-3, therefore further study on active ingredients of GLM extracted is necessary.

After 1 month of the treatment, the dog showed deterioration of clinical signs due to hypovolemia from the leak of intravascular fluid, then dosage of PCSO-524® (Vetz Petz® Antinol®) was doubled in order to increase the amount of omega-3 fatty acids and other anti-inflammatory agents. Prednisolone 0.5 mg/kg every 24 hours was added to the prescription to reduce the inflammation in case of severe clinical signs and no response to the standard treatment scheme (Brown et al., 2013).

The treatment follow-up in this case found the clinical signs were improved as ascites and edema disappeared, serum albumin was increased to normal level (higher than 2.5 mg/dl), and there was more than 50% reduction of UPC.

No adverse effects of ACE inhibitors were observed during the 10-month follow up since potassium level was lower than 6 mEq/L and creatinine did not exceed 30% of the initial value. Since there was no cure for the disease, the dog needs a follow up on clinical signs and supportive treatment to delay the progress of the damage and to prevent complications. The disease prognosis is similar to that of chronic kidney failure.

Conclusion

The success of the treatment of **protein losing nephropathy** depends on rapid and accurate diagnosis and identification of underlying causes. For the presented case, hypertension is highly suspected to be the underlying cause considering no other die was found. Although the animal may not show sign of azotemia in the first visit, the development of kidney failure must be concerned.

Supportive therapy concurrently used with prevention of complications is necessary for the treatment and selection of wrong choices of medication may accelerate the kidney damage.

PCSO-524® was used for supplementary treatment due to various properties to prevent kidney damage without causing adverse effects. The inflammatory effect was reported in treatment of inflammation of the other systems such as musculoskeletal diseases, gastroenteritis, pancreatitis, hepatic diseases, and cancer.

Acknowledgement

The author is grateful to Supatra Yongsiri, DVM, the owner of the dog, veterinarians and staff of Suwanachad Animal Hospital.

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Case Report

Use of PCSO-524® (Antinol®) in a Pomeranian Dog with Degenerative Mitral Valve Disease (DMVD) and Cardiac Tumor of the Left Atrium

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Antinol® (PCSO-524®)
Case Study Contest 2020

Use of PCSO-524® (Antinol®) in a Pomeranian Dog with Degenerative Mitral Valve Disease (DMVD) and Cardiac Tumor of the Left Atrium

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Abstract

A 10-year old Pomeranian dog with degenerative mitral valve disease (DMVD) and cardiac tumor of the left atrium was treated with **pimobendan, ramipril,** and **furosemide** in conjunction with **PCSO-524® (Antinol®)** as supplemental therapy.

After the treatment, the dog showed improved ability to conduct various activities, increased appetite and ingestion, weight gain and disappearance of paroxysmal ventricular premature contraction (VPC).

The C-reactive protein (CRP), which is an inflammatory marker in dogs, also decreased to normal level within 21 days of PCSO-524® (Antinol®) supplementation.

Keywords: PCSO-524® (Antinol®), Degenerative Mitral Valve Disease (DMVD), cardiac tumor

Degenerative Mitral Valve Disease (DMVD) is a common cardiovascular disease found in dogs that approximately 30% of dogs older than 10 years are affected by the disease (Oyama A., 2012).

Symptoms of the disease include degeneration and thickening of mitral valve which causes mitral value insufficiency (Suh H., et al., 2012). The disease is characterized by systolic murmur heard at the left sternal border which indicates degenerative mitral valve disease (DMVD) and mitral regurgitation (MR).

Degenerative Mitral Valve Disease (DMVD) is frequently found in **small breed dogs** and some specific breed dogs with high risk, for example, Cavalier King Charles Spaniels dogs that develop degeneration of mitral valve for the entire life.

When the condition of degenerative mitral valve disease (DMVD) is worse, the degree of mitral regurgitation (MR) increases (Oyama A., 2012) and leads to congestive heart failure and pulmonary edema. If the dilation of the left atrium can no longer compensate for the dynamics of blood flow, mitral regurgitation will cause volume overload and death may occur due to cardiac failure in dogs (Suh H. et al., 2012).

Cardiac tumor is often identified by chance in dogs and cats. The tumors that are frequently found include hemangiosarcoma (HSA), aortic body tumors (chemodectoma and paraganglioma) lymphoma and ectopic thyroid carcinoma. The degree of symptoms ranges from mild to severe depending on type of tumor, disturbances in the cardiovascular system, location of the hemorrhage, and pericardial effusion.

Treatment for cardiac tumor is symptomatic and aimed for **control of bleeding** caused by the tumor, arrhythmia, and other complications (Treggiari E. et al., 2017).

Primary cardiac tumor originates from the heart and the secondary tumor is caused by metastasis to the heart (Aupperle et al, 2007). Ultrasonography imaging often identifies cardiac tumor but to differentiate the type of tumor, pathological examination at post mortem is necessary (Treggiari E. et al., 2017).

The tool with highest potential for ante-mortem diagnosis of cardiac tumor is **echocardiography**, which processes information of tumor location and tumor characteristics, such as echo texture and invasiveness, to develop a diagnosis result.

A retrospective study conducted by University of Tennessee and John and Ann Tickle Small Animal Hospital during 2006-2012 in 24 dogs compared diagnosis results for type of tumor at the heart base between ultrasonography and pathological examination. The ultrasonography was able to correctly identify chemodectoma, ectopic thyroid carcinoma and lymphoma in 7 out of 9 dogs that was diagnosed with the diseases by **pathological examination.**

The two diagnosis tools also showed agreement for diagnosis of **hemangiosarcoma**, which is a tumor of the right atrium, in 4 out of 8 dogs. The ultrasonography also detected pericardial effusion in 10 out of 24 dogs and ECG abnormalities in 8 out of 24 dogs. Survival time of dogs affected with the disease is between less than 1 day to greater than 150 days.

Diagnosis of tumor type by locating the tumor using **echocardiogram** is moderately accurate and additional examination tool is essential, such as analysis of **cardiac troponin** and **pericardial fluid, fine-needle aspiration, serum T4 concentration, cross-sectional imaging,** and **thoracoscopy** or thoracotomy. Tumor types most often identified by echocardiographic examination are HSA, CD, ETC, and LSA (Rajagopalan V. et al., 2013). Low level of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), components of omega-3 polyunsaturated fatty acids, are found in cell membrane and can increase by supplementation of diet that promotes cardiac function and appetite, and reduces inflammation and cardiac arrhythmia (Freeman, 2013).

Case History

A 10 years old, intact, male Pomeranian dog weighed 2.1 kilograms had gradually lost body weight from 2.85 to 2.1 kilograms during the past 2 years.

The dog showed signs of depression, fatigue, lethargy, loss of appetite, occasionally cyanotic mucous membrane, paresis of hind legs, general and rat tail alopecia, and pigmented skin. The dog was fed with Royal Canin® adult dogs formula.

Diagnostic plan and diagnosis

Physical examination found 99 °F body temperature, 2/5 body condition score, paresis of hind legs, restlessness, occasional dyspnea, cyanotic mucous membrane during the examination but normal at rest, CRT less than 2 seconds, 140 beats per min heart rate, murmur level 3, 124 and 90 mmHg for systolic and diastolic pressure, respectively, general and rat tail alopecia, and pigmented skin.

Hematological and biochemical test results

Hematological tests showed results within normal ranges (Table 1).
Blood chemical tests found that
C-Reactive Protein (CRP) was 51.7 mg/L, which was higher than normal (Table 2),
thyroid hormone was normal (1.4 mcg/dl) and blood glucose was 90 mg/dl.

Radiographic examination

X-ray images revealed normal heart size with vertebral heart score (VSH) 10.1 (Figure 1) and electrocardiogram examination found paroxysmal ventricular premature complex (VPC) of the heart (Figure 3).

Degenerative Mitral Valve Disease (DMVD) with severe Mitral Regurgitation and **left atrial enlargement** was identified (Table 3). A mass was found at left atrium near the heart base and heart base tumor was diagnosed (Figure 5).

Treatment outcome and Follow-up

The dog received oxygen therapy for 24 hours and ramipril 1.25 mg 0.5 tablet sid, pimobendan 1.25 mg 0.5 tablet bid, furosemide 40 mg 0.125 tablet bid were prescribed.

After 7 days of treatment, PCSO-524® (Antinol®) 1 capsule bid was added to the program.

Improvement of clinical signs including **normal mucous membrane, CRT** less than 2 seconds, and **absence of dyspnea** were observed after 7 days of the treatment but lethargy and loss of appetite still remained. When PCSO-524® (Antinol®) was given to the dog after 7 days of the treatment, the dog apparently gained alertness and engaged in various activities with improvement of motility balance and no dyspnea. Prolonged period of walking and running was observed at 30 and 60 days, respectively, after PCSO-524® (Antinol®) was administered. The dog had regained appetite and the body weight increased from 2.1 to 2.55 kilograms within 6 months.

Hematological examination before and after the administration of PCSO-524® (Antinol®) showed no significant difference (Table 1).

Table 1. Hematological test results before and after the administration of PCSO-524® (Antinol®)

CBC	unit	Normal values	Day -7*	Day 0**	Day 7	Day 14	Day 21	Day 30	Day 45	Day 60	Day 90	Day 120	Day 150	Day 180
RBC	x106/µl	5.5-8.5	6.6	6.7	7.7	6.9	6.8	6.3	7.7	7	7.4	7.7	7.2	6.2
Hemoglobin	g/dl	12.0-18.0	15.6	15.8	18.3	16.3	15.7	13.8	16.2	16.9	16.1	17.9	16.7	14.3
Haematocrit	%	37.0-55.0	46	43	55	44	48	42	48	45	47	51	47	43
WBC	Cell/ mm3	6.0-17	8,800	11,900	11,800	6,000	10,100	7,200	7,100	9,800	9,100	12,800	8,600	6,300
Neutrophils	%	60-77	70	70	76	77	77	70	76	85	83	81	63	66
Bands	%	0-3	0	0	0	0	0	0	0	0	0	0	0	0
Eosinophils	%	2.0-10.0	1	6	1	3	5	6	6	0	4	2	6	5
Lymphocytes	%	12.0-30.0	26	22	20	17	16	23	15	13	10	15	29	28
Monocytes	%	3.0-10.0	3	2	3	3	2	1	3	2	3	2	2	1
Platelet	103/µl	200-500	268,000	204,000	314,000	246,000	354,000	334,000	324,000	462,000	226,000	212,000	373,000	584,000

Biochemical tests performed on day 21 after PCSO-524® (Antinol®) was started showed that **C-reactive protein (CRP)** returned to normal value and remained normal until 6 months after the treatment (Table 2).

Table 2. Blood chemical test results before and after the administration of PCSO-524® (Antinol®)

Blood Chemistry	unit	Normal values	Day -7*	Day 0**	Day 7	Day 14	Day 21	Day 30	Day 45	Day 60	Day 90	Day 120	Day 150	Day 180
ALT(SGPT)	Units	10.0-118.0	100	98	78	43	65	102	112	65	92	86	96	75
Alkaline Phosphatase	pIU/Ls	20.0-150.0	102	87	116	99	78	65	98	90	110	135	85	89
BUN	mg%	7.0-25.0	18	12	14	14	15	13	14	13	13	15	17	12
Creatinine	mg%	0.3-1.5	1.1	1.3	0.9	1.3	1.4	1.3	1.3	1.2	1.4	1.3	1	1.3
CRP	mg/L	<20	51.7	63.2	39.5	22.4	<10	<10	<10	<10	<10	<10	<10	<10

*Day-7: Time period when DMVD and cardiac tumor were treated with pimobendan, ramipril and furosemide without PCSO-524® (Antinol®) supplement.

**Day0: The day when PCSO-524® (Antinol®) was started.

D7-D180: Day7 to Day180 after the treatment with PCSO-524® (Antinol®) supplement.

Radiographic and Echocardiogram examination results

X-ray images of thoracic cavity showed that Vertebral Heart Score (VSH) was 10.1 prior to the treatment (Figure 1) and back to normal range, 10.6, after the treatment (Figure 2).

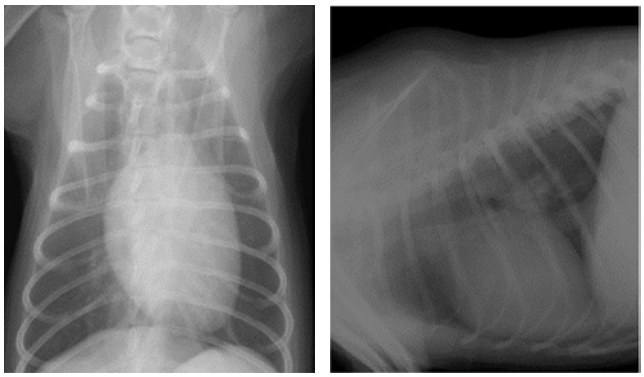


Figure 1. X-ray image of thoracic cavity of a 10 years old male Pomeranian dog showed that Vertebral Heart Score (VSH) was 10.1 prior to the treatment

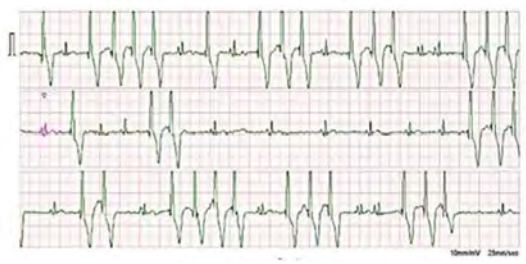


Figure 3. Echocardiogram (ECG) prior to the treatment

Echocardiogram prior to the treatment found **paroxysmal ventricular premature contraction (VPC)** (Figure 3) and **respiratory sinus arrhythmia** was found without ventricular premature contraction (VPC) after the treatment (Figure 4).

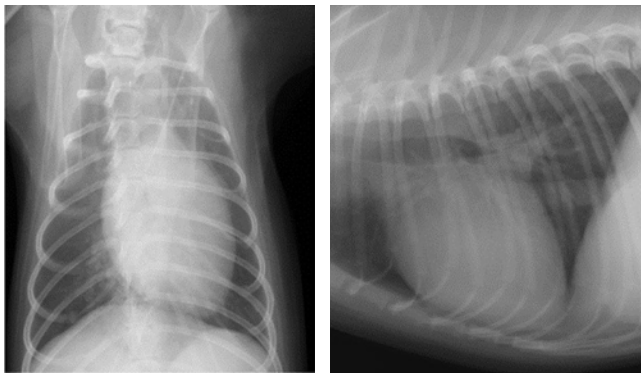
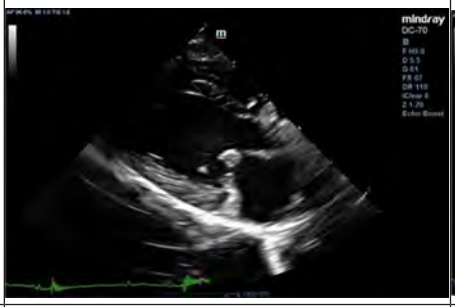
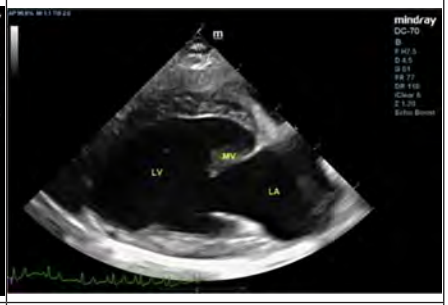
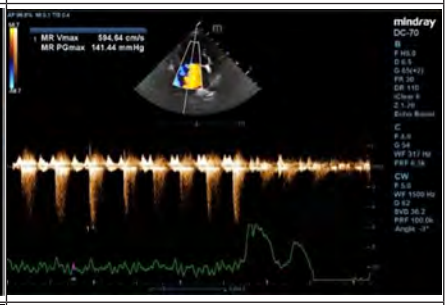
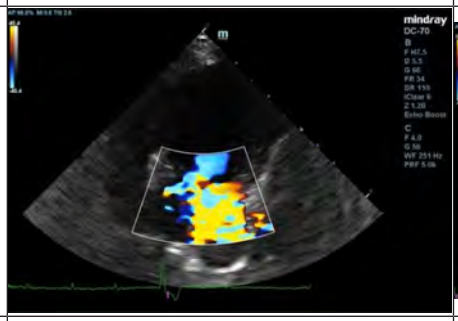
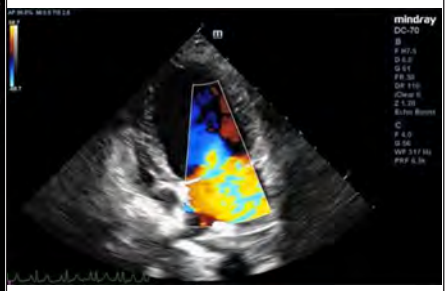
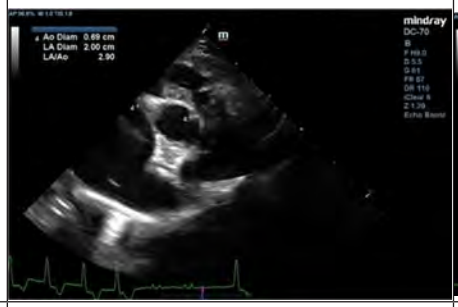
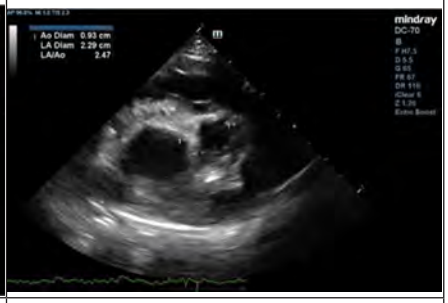
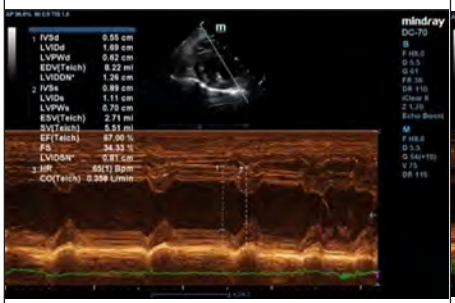
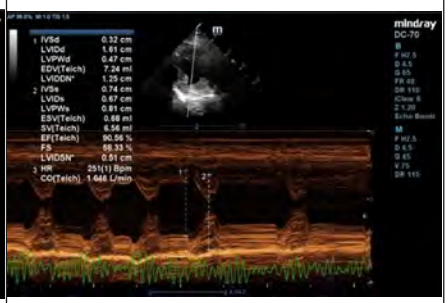


Figure 2. X-ray image of thoracic cavity of a 10 years old male Pomeranian dog showed that Vertebral Heart Score (VSH) was 10.6 after the treatment

Figure 4. Echocardiogram (ECG) after the treatment

The echocardiogram examination revealed Degenerative Mitral Valve Disease (DMVD) with **severe Mitral Regurgitation (MR)** and **left atrial enlargement** (Table 3) and a mass in the left atrium at the heart base. The dog was diagnosed with **heart base tumor** both prior to the treatment (Figure 5) and after the treatment (Figure 6).

Table 3. Results of echocardiogram examination prior to and after the treatment

Echocardiogram	Before treatment	After treatment
1. Degenerative Mitral Valve Disease (DMVD)		
2. Mitral Regurgitation (MR)		
3. Color flow		
4. LA/Ao ratio		
5. M-mode Echocardiography		

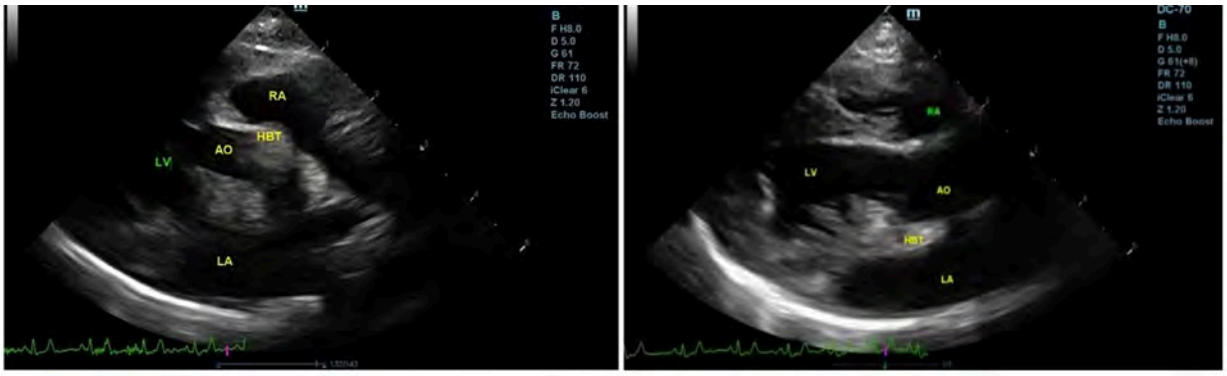


Figure 5. Results of echocardiogram examination prior to the treatment showed cardiac mass in the left atrium at the heart base which led to diagnosis of heart base tumor

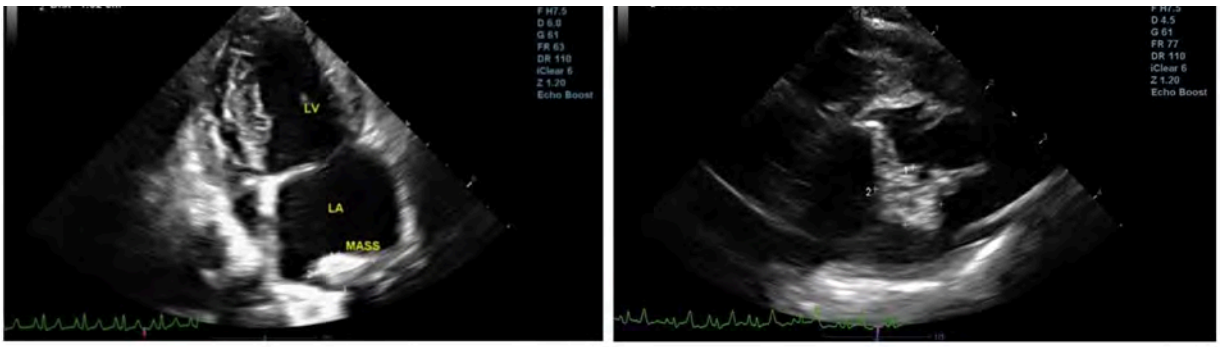


Figure 6. Results of echocardiogram examination after the treatment showed cardiac mass in the left atrium at the heart base which led to diagnosis of heart base tumor

Discussion

Within 6 months of the cardiac tumor treatment with PCSO-524® (Antinol®), the dog showed signs of recovery which included becoming more energetic, lack of dyspnea, resuming normal activities, improved motility balance, stable walking and running, increased appetite, and increased body weight from 2.1 to 2.55 kilograms.

Supplementation of Omega-3 is effective in humans with **congestive heart failure** (CHF) and also effective against **cardiac arrhythmia in dogs.**

Anti-inflammatory action of omega-3 is the effect of decreased inflammatory cytokine in cardiovascular system resulting in increased appetite in dogs with cardiac cachexia. The recommended dosage of EPA and DHA in dogs is 40 and 25 mg/kg, respectively (Cunningham and Hall, 2011).

PCSO-524® (Antinol®) is extracted from New Zealand Green Lipped mussels (Perna Caniculus) and additionally added with olive oil and vitamin E.

It contains **sterol esters, sterols, polar lipids, triglycerides and free fatty acid; EPA and DHA**, which inhibit the action of proinflammatory leukotriene (LT) B4 in human monocytes and decrease thromboxane B2, prostaglandin (PG) E2 and interleukin (IL) 1β.

The mechanism of action is similar to that of **omega-3 PUFA** (Mickleborough, 2013). The anti-inflammatory effect is demonstrated for both prevention and treatment of the disease. Other additional effects include **gastroprotective, antihistamine, antioxidant, anticytokines and antiarthritis effects** (Coulson et al., 2015).

The study found decrease of C-reactive protein (CRP) on day 21 after the treatment with PCSO-524® (Antinol®). C-reactive protein (CRP) is an acute phase protein that is an essential inflammatory marker synthetized in liver of dogs and can rapidly increase during an acute inflammation and decrease when the cause of inflammation is removed.

PCSO-524® (Antinol®) is a diet supplement that mainly contains **omega-3** polyunsaturated fatty acid, such as **eicosapentaenoic (EPA) and docosahexaenoic (DHA),** which are known for **cardio protective effect, anti-inflammatory effect and immunomodulatory activity.** The amount of omega-3 polyunsaturated fatty acids contained in PCSO-524® (Antinol®) is more than that found in fish oil (Jamikorn and Yibchok-anun, 2014).

The echocardiogram examination revealed that paroxysmal ventricular premature contraction (VPC) disappeared on day 21 after the treatment with PCSO-524® (Antinol®). **Paroxysmal ventricular premature contraction (VPC)** is caused by electrical pulse from ventricle that interacts with the normal cardiac pulse. It can occur individually, in double, triple or more pulses, sometimes results in paroxysmal or tachycardia that lasts for more than 15-30 seconds.

The cause may be associated or not associated with the heart, for example, ventricular hypertrophy (concentric or eccentric hypertrophy), hypoxemia, hypovolemia, hypotension, acid-base imbalance, electrolyte disturbance, trauma, cytokines, some medications such as digitalis, barbiturates, and antiarrhythmic drugs, myocardial ischemia, pain, gastric dilation-volvulus, and shock. The true cause of arrhythmia should be identified in order to achieve treatment success (Schwartz D. et al., 2009).

VPC can result in reduction of cardiac output, atrial blood pressure, vascular flow, and hypotension. Ventricular arrhythmia may lead to fluctuation of electrical pulse and death from ventricular fibrillation (Schwartz D. et al., 2009).

Conclusion

Use of PCSO-524® (Antinol®) in a dog with degenerative mitral valve degeneration and cardiac tumor in this study was successful for improvement of life quality, resumption of activities, increased appetite and body weight as a result of the effect of **omega-3 polyunsaturated fatty acids**.

The eicosapentaenoic (EPA), docosahexaenoic (DHA), omega-3 polyunsaturated fatty acid, are known to have cardio protective effect, anti-inflammatory effect, and immunomodulatory activity, particularly by inhibition of the action of C-reactive protein (CRP), which is an inflammatory marker in dogs.

It also eliminated paroxysmal ventricular premature contraction (VPC) in this case, which may due to the action of polyunsaturated fatty acids since there was a report on successful use of polyunsaturated fatty acids to reduce degree of cardiac arrhythmia (Freeman, 2013). The effect of omega-3 fatty acid for prevention of ischemic-induce ventricular fibrillation was also demonstrated in experimental dogs (Billman G. et al., 1999).

Cardiac cachexia is a condition of body mass loss due to irregularity of cardiac function. The condition is common in animals with congestive heart failure (CHF) and can result in weakness, reduced immunity and survival probability.

The causes of cardiac cachexia syndrome include anorexia, increased energy requirement, and metabolism change. The main cause of cachexia is inflammatory cytokines, such as tumor necrosis factor and interleukin 1, which lead to clinical signs of anorexia, increased energy requirement, and loss of body mass.

Treatment of the symptoms is to **stop the action of cytokines** by using fish oil supplement that contains high level of omega-3 polyunsaturated fatty acids, for example. Fish oil is effective against cachexia and congestive heart failure (CHF), which is the cause of anorexia, therefore it increases appetite of the animals (Freeman, 2013).

High amount of polyunsaturated fatty acid is also found in PCSO-524® (Antinol®), as a result, it improves the condition of cardiac cachexia and increases appetite and body weight.

Treatment of degenerative mitral valve degeneration (DMVD) and cardiac tumor may include **medication to restore normal cardiac function and blood pressure**, and **control of inflammation**. Veterinary care and attention of the owner are necessary since there is a risk for acute complications.

The diagnosis of cardiac tumor using **ultrasonography** to locate the tumor is considered the best diagnostic method in live dogs. Further examination to identify type of the tumor must concern safety of the animals, for example, examination of pericardial fluid is performed in case of pericardial effusion.

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Case Report

Use of PCSO-524® (Antinol®) for Treatment of Chronic Pododermatitis in Fighting Cocks

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Antinol® (PCSO-524®)
Case Study Contest 2020

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Abstract

A 2-year-old male fighting cock with 2.4 kilograms body weight had been showing sign of left leg lameness for 2 months. The left plantar area was swollen and unable to bear weight. On physical examination, the cock was diagnosed with chronic pododermatitis or bumble foot.

Only non-surgical procedures were allowed for the treatment according to the owner's decision. **NSAID, antibiotic and PCSO-524®** (Antinol®) were administered for 2, 4 and 5 weeks, respectively.

Improvement of performance was evaluated using **kinetic gait analysis** to measure the peak vertical force of weight bearing on pressure mapping platform.

After NSAID was terminated, while PCSO-524® was prolonged, the weight bearing and other clinical signs continued to improve.

In conclusion, PCSO-524® is proved to be effective for treatment of chronic pain in this fighting cock.

Keywords: bumble foot, fighting cock, gait analysis, PCSO-524®, pododermatitis

Introduction

Pododermatitis or bumble foot is the inflammation of foot pad in chickens. The lesion may range from mild inflammation to severe infection of bone tissues. The disease is common in poultry industry and can be found in broilers, layers, pet chickens, birds of prey, and fighting cocks.

The clinical symptoms include swelling, infection and inflammation of foot pad resulting in mobility impairment, slow growth rate, infertility, and risk of death from infection. The risk factors are usually associated with improper management such as high density in the cage that chicken movement and physical gesture change are limited, accumulation of waste in the cage, high humidity or low ventilation that enhance the growth of microorganisms, and poor bedding management.

Various causes of the disease include exposure of chicken feet to coarse bedding materials that cause too much scrub irritation or skin abrasion, contamination of foreign materials in the bedding, cockfighting wound, and malnutrition such as obesity and hypovitaminosis A that can result in inflammation of foot pads.

Microorganism that is most identified as cause of the disease is **Staphylococcus aureus**. It is commonly found in the environments and can be easily transmitted from animals or contaminated materials to humans via open wound. Endotoxin synthesized by the bacterium can stimulate hypersensitization mechanism that consequently causes tissue damage, vasculitis, and caseous abscess which is a form of infection in avian species. Other microorganisms can be isolated from pododermatitis lesion in chickens include Escherichia coli and Proteus.

Essential protocol for treatment of pododermatitis in pet birds is **management of animal habitat for long-term care** and prohibition of lesion progress and recurrence of the disease. Wound dressing, bandaging, and empirical treatment such as non-steroidal anti-inflammatory drugs (NSAIDs) and antibiotics in case of infectious wound are effective for the therapy.

Surgical treatment to remove pus and tissue debris is necessary in case of deep tissue infection, caseous abscess and necrosis of the foot pads. Bandage of foot pads is also effective for the treatment. Within 2-5 weeks after the treatment, tissue reconstruction is observed (Rafee, MA et al., 2016). However, the damage caused by foot pad inflammation may affect living quality of the animals due to pain and impairment of weight bearing and limb function. There is **limitation in use of NSAIDs in avian animals** to reduce pain and inflammation due to adverse effects of long-term use.

Neutraceutical substances containing **essential fatty acids** that are elements of omega-3 and omega-6 are effective for long-term treatment of pain and inflammation in pododermatitis, and can be used in conjunction with NSAIDs. Studies to develop supplementation of omega-3 and omega-6 in poultry industry demonstrated its efficacy for enhancement of growth, immunity and fertility performance (Alagawany, M. et al., 2019).

Assessment of the treatment outcomes is conducted by observation of chicken behavior in the usual environments by the owner and physical examination by veterinarians. The most valid method for treatment evaluation is the measurement of weight bearing as it can assess the complete restoration of the limb function. **Gait analysis** in veterinary use is now widely accepted as an effective tool for assessment of weight bearing and treatment outcome. Additionally, the analysis is classified as objective assessment that effectively eliminates the bias of the observers.

PCSO-524® (Antinol®) is supplement made from New Zealand Green lipped mussels that contain essential fatty acids belonging to main elements of omega-3. The supplement is effective against inflammation and can be used in conjunction with NSAIDs for treatment of chronic pododermatitis in brood cocks. It enhances the treatment outcome and restores fertility of the brood cocks. The follow-up examination to evaluate the treatment outcome are performed by observation of daily activities by the owner and assessment using gait analysis with pressure mapping platform.

Case History

A male 2 years old fighting cock weighed 2.4 kilograms was submitted to the exotic pet clinic at the animal hospital, Kasetsart university, Bang Khen campus. Presented clinical signs include swollen left foot pad that was unable to bear weight for over 2 months. The cock was alert with normal appetite.

Physical examination

Figure 1. The fighting cock submitted for examination on day 1 showing sign of leg lifting, swollen foot pad, and complete loss of weight bearing of the left leg.

Examination from distance inspection found that the cock lifted his left leg the entire time while walking and weight bearing on this leg was avoided (Figure 1).

Response to other environmental stimulus was normal. The left tarsometatarsal joint was swelling, red and warm on palpation. Neither accumulation of secretion nor crepitus sound was found at the joint. Body condition score was categorized as normal (3/5).

Further diagnosis was done by radiographic image and biopsy of the foot pad for cytological examination and bacterial culture and sensitivity test.

Result of radiographic examination

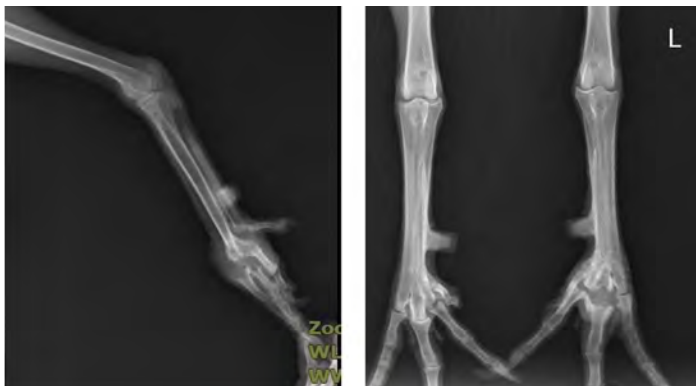


Figure 2. Radiographic images show lysis of the left tarsometatarsal bone.

Radiographic images taken from distal tibiotarsal to metatarsal bones showed radiolucent area at the left distal tarsometatarsal bone which indicated bone lysis in this area (Figure 2).

Cytological test and bacterial culture results

A large number of red and white blood cell was found at the lesion.
Majority of the white blood cell included heterophils and monocytes, which indicated inflammation of the foot pad. Bacterial culture found no growth of bacteria.

Diagnosis of chronic pododermatitis or bumble foot was then concluded based on preliminary examination and case history.

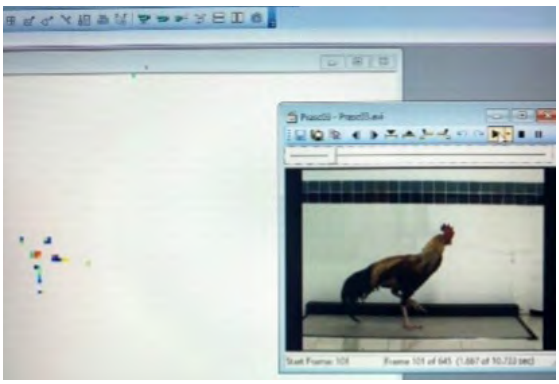
Treatment and Follow-up

Empirical treatment consisting of NSAIDs, antibiotic, and neutraceutical supplement was designed for the animals.

The NSAID; 0.5 mg/kg Meloxicam sid for 2 weeks,
antibiotic; 125 mg/kg Amoxicillin-clavulanic acid bid for 4 weeks,
and 1 capsule of PCSO-524® (Antinol®) sid for 5 weeks were prescribed.

The kinetic gait analysis was performed by setting the cock on standing position on the pressure mapping platform for 10 seconds. Pressure on the foot pad was measured by determining Peak vertical force (PVF) of each leg and then averaging over 10 seconds.

The measurement was repeated 5 times and the average was calculated for each kinetic gait analysis (Table 2).



Kinetic gait analysis.

Figure 3. The cock lifted its left leg for the entire time during the first kinetic gait analysis.

Figure 4. Improved weight bearing of the left leg after 2 weeks of treatment

Figure 5. After 5 weeks, the cock showed improvement of weight bearing of the left leg.

Kinetic gait analysis using pressure mapping platform on day 1 showed **complete loss of weight bearing on the left foot** (figure 3).

After 2 weeks, the follow-up examination found improvement of clinical signs as partial weight bearing was restored (Figure 4). However, the pad swelling was still present.

After 3 weeks, continuing improvement was observed. The owner reported that the cock was able to run on sand ground and chase female chickens in the habitat. Examination using pressure mapping platform showed increased weight bearing of the left leg (Figure 5).

After 5 weeks, the cock had improved walking mobility and was able to mount a female chicken. Other clinical signs were within normal range. The swelling of the left foot was reduced and weight bearing was improved.

Table 1. Treatment and follow-up examination.

Week	Treatment and follow-up			
	Antibiotic	NSAIDs	PCSO-524	Gait analysis
0	✓	✓	✓	✓
2	✓	✓	✓	-
3	✓	-	✓	✓
5	-	-	✓	✓

Table 2. Results of kinetic gait analysis using pressure mapping platform

Visit (Body weight)	% Body weight	
	Right leg	Left leg
1 (2.4 kg)	101.6%	0
2 (2.47 kg)	71.65%	29.92%
3 (2.46 kg)	54.91%	45.03%

Conclusion and Discussion

Pododermatitis or bumble foot is a disease of birds living in limited captive space such as pet birds and fighting chickens. It is also reported in birds of prey, penguins, and teals (Wyss, F. et al., 2015).

The infection of foot pad can cause chronic inflammation and pain that decreases the living quality of the animals. The most common etiology of the disease is improper management.

Further diagnosis is performed by radiographic examination in order to assess bone lysis from deconstruction of bone and tissue. Bacterial and sensitivity test are necessary for selection of effective antibiotics.

Treatment of pododermatitis in birds is consisting of 4 principle rules that are

1) Oral antibiotic for infection control,
2) Direct injection of antibiotic to the lesion,
3) Surgical removal of damaged tissue,
and 4) Bandage after the surgery.

Such treatment is accepted widely and the treatment outcome is usually satisfied

(Remple, JD. Et al., 2006).

The studied case was a 2-years old fighting cock presented with swollen left foot pad and complete loss of weight bearing for more than 2 months.

Chronic pododermatitis was diagnosed. Cytological test performed to evaluate the severity of bone lesion showed presence of inflammatory cells without other indication of cell abnormality. Bacterial culture did not find any growth of bacteria possibly due to lack of bacteria at the spot where sample was collected or the lesion that was truly free from bacterial infection.

It is recommended that samples should be collected from affected tissues during the surgical treatment for further bacterial culture. However, in this case, surgical treatment was not approved by the owner so medication was selected as the treatment of choice.

During the first 2 weeks of treatment, antibiotic was administered to control infection in conjunction with NSAIDs and PCSO-524® to reduce pain and inflammation. **Long-term use of NSAIDs was limited** due to side effects on kidney and gastrointestinal tract, therefore not applicable in this chronic pododermatitis case. Visceral gout is reported as a result of diclofenac use in quail and psittacine birds (Palocz, O. et al., 2015). Use of **PCSO-524®**, which is a neutraceutical substance that is effective for relief of tissue inflammation, is recommended for **long-term administration** without any adverse effects.

Reduction of observer bias is done by application of objective assessment using pressure mapping platform to measure the weight bearing in conjunction with physical examination by veterinarians. The agreement of results of the 2 approaches are confirmed.

The first evaluation of **Peak vertical force (PVF)** using pressure mapping platform before beginning of the treatment showed only weight bearing of the right leg and none of the left leg. After 2 weeks of treatment, the owner reported improvement of mobility such as walking and jumping. The weight bearing of the left leg was increased by approximately 30%.

During the third examination on the pressure mapping platform and 5 weeks in the treatment, the weight bearing of the left leg increased from 30% to 45% and the weight bearing gap difference between both legs was reduced. The measurement result was consistent with owner's report of the cock behavior and the physical examination.

The antibiotic and PCSO-524® was terminated after 4 and 5 weeks, respectively.

The study showed that **long-term use** of PCSO-524® is effective against chronic pain and inflammation without causing any adverse effects. Use of neutraceutical supplementation that is consisting of **essential acids of omega-3** is widely accepted for its anti-inflammatory effect (Zawadzki, M. et al., 2013).

Conclusion

Essential fatty acids are also used in poultry industry for enhancement of growth, fertility, immunity, egg and feed conversion (Alagawany, M. et al., 2019).

In this study, the cock received PCSO-524® for 5 weeks and showed improvement of weight bearing, daily activity, and fertility which is consistent with previous studies that demonstrate **the benefit of adding omega-3 and omega-6 in poultry diet** for farming industry.

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Case Report

Use of PCSO-524® with Physical Rehabilitation to Regain Mobility in Dogs after Femoral Head and Neck Excision

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Antinol® (PCSO-524®)
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Use of PCSO-524® with Physical Rehabilitation to Regain Mobility in Dogs after Femoral Head and Neck Excision

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Abstract

An 8 years old Pomeranian dog showed acute non weight-bearing lameness of the right hind limb after high jumping. Preliminary examination identified pain at the right hip and radiographic images revealed right hip luxation.

Femoral head and neck excision was performed for the surgical treatment.

Multimodal treatment scheme deployed after the surgery consisted of neutraceutical PCSO-524® and physical rehabilitation using laser class 4, exercise such as Cavaletti exercise, balanced board, walking on treadmill, and hydrotherapy including walking under water and swimming.

Evaluation of the treatment during follow-up showed decreased pain score and severity of lameness, which was consistent with the owner's report that described improvement of weight- bearing of the right hind limb and the quality of life.

Keywords: Femoral head and neck excision, Hip luxation, PCSO-524®, Rehabilitation

Introduction

Femoral head and neck excision (FHNE) is used for treatment of various diseases such as severe osteoarthritis, avascular necrosis, hip luxation and hip fracture. The diseases cause pain and limited joint function due to decreased weight-bearing ability that results in muscle atrophy and poor life quality.

After the surgery, scar tissue is formed between femoral head and hip joint socket as a cushion to absorb the force from movement. There are cases of severe or chronic pain that occurs before the surgery and results in muscle atrophy and loss of mobility.

To restore function of the leg after the surgery, **multimodal treatment**, which consists of rehabilitation therapy and neutraceutical supplement, is deployed to accelerate the recovery and resumption of the normal life. The rehabilitation after femoral head and neck excision includes several techniques, for example, control of pain using laser class 4 or therapeutic ultrasound, exercise such as balancing ball or balancing board to enhance standing and weight shifting, hydrotherapy such as swimming and under water treadmill walking.

The rehabilitation scheme is designed for individual dogs under consideration of veterinarians. PCSO-524® now is becoming more common as neutraceutical supplement that is effective for rehabilitation therapy.

The supplement is extracted from New Zealand Green Lipped mussel and contains high amount of omega-3 and omega-6, therefore it is effective against pain and inflammation. It is an alternative to non-steroidal anti-inflammatory drugs (NSAIDs) for **long-term or high dosage treatment** since it has no side effects found in NSAIDs use.

Case history

An 8 years old female Pomeranian dog weighed 5 kilograms was admitted at a veterinary hospital due to signs of acute non-weight bearing of the right hind limb after a high jump 2 days before. The owner informed that the dog had never shown any signs of walking disorder.

Physical examination

Normal vital signs were found by physical examination and the orthopedics examination found lameness of the right hind leg with lameness score 4, which means totally loss of weight bearing in every gesture including standing, walking and running.

Palpation of the right hip identified pain score 4 based on severe pain and expression of yelping and aggression when the injured area was palpated. No other signs of injury were found.

Diagnostic plan and Results

Radiographic examination was used for further diagnosis based on information from case history and the preliminary orthopedics examination. Displacement of right femoral head was identified and diagnosis of right hip luxation in craniodorsal direction and osteoarthritis of both hips were concluded (Figure 1 and 2).

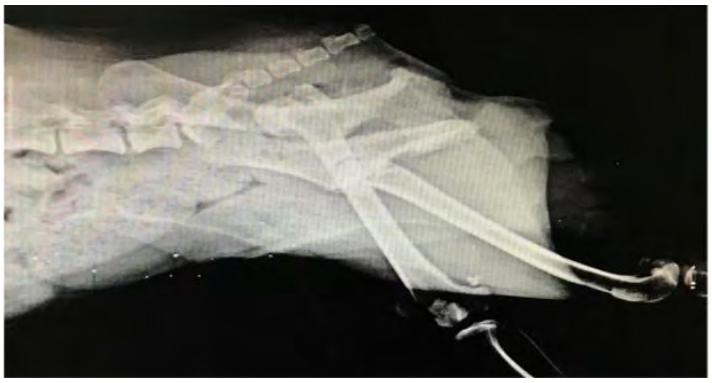

Figure 1. X-ray image showing right hip luxation

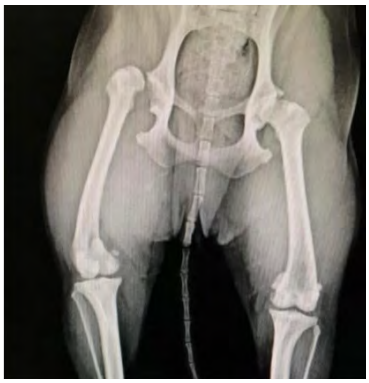

Figure 2. X-ray image showing both hip osteoarthritis

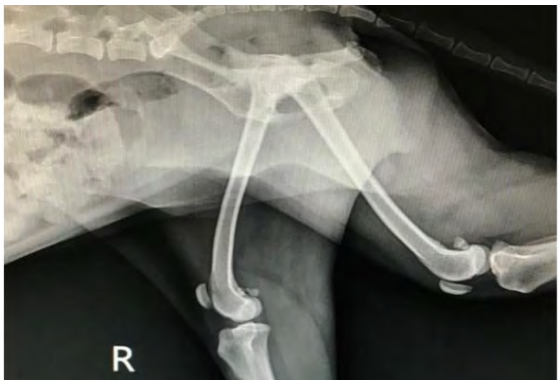

Figure 3. X-ray image showing lateral view of hip joints after right femoral head and neck excision

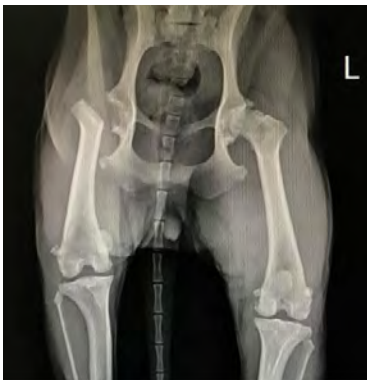

Figure 4. X-ray image showing ventrodorsal view of hip joints after right femoral head and neck excision

Treatment

The empirical treatment included carprofen (Rimadyl®) 2.5 mg/kg bid for 3 consecutive days to reduce pain and inflammation. Then the dog received femoral head and neck excision of the right femur (Figure 3 and 4) and carprofen (Rimadyl®) 2.5 mg/kg bid was continued for another 4 days after the operation.

To prevent infection of the surgical wound, cephalexin 25 mg/kg bid was given for 7 days after the surgery. The dog also received PCSO-524® (Antinol®) 1 capsule per day since the first day of hospital visit before the surgery and continued after the surgery to enhance the recovery of osteoarthritic joints and to reduce pain. **Rehabilitation therapy** was deployed after the surgery (Table 1).

Table 1. Medical and rehabilitation treatment schemes

Week	Medical treatment	Rehabilitation treatment
1	Carprofen (Rimadyl®) 2.5 mg/kg bid 4 days	Laser therapy class 4 (Figure 5) - Right hip - Energy level 5 J/cm2 - Surface area 30 cm2 - Time: 4 minutes per shot - Frequency: Twice a week - Duration: 3 consecutive weeks
	Cephalexin 25 mg/kg bid 7 days	
	PCSO-524® (Antinol®) 1 capsule per day	
2	PCSO-524® (Antinol®) 1 capsule per day	
3	PCSO-524® (Antinol®) 1 capsule per day	
4	PCSO-524® (Antinol®) 1 capsule per day	Exercise once a week - Balance board (Figure 6) - Cavaletti exercise (Figure 7) - Land treadmill walk
5	PCSO-524® (Antinol®) 1 capsule per day	
6	PCSO-524® (Antinol®) 1 capsule per day	
7	PCSO-524® (Antinol®) 1 capsule per day	Hydrotherapy (Figure 8) once a week - Underwater treadmill walk - Swimming
8	PCSO-524® (Antinol®) 1 capsule per day	
9	PCSO-524® (Antinol®) 1 capsule per day	
10	PCSO-524® (Antinol®) 1 capsule per day	
11	PCSO-524® (Antinol®) 1 capsule per day	
12	PCSO-524® (Antinol®) 1 capsule per day	

Figure 5. Laser class 4 therapy at the right hip

Figure 6. Balance board exercise

Figure 7. Cavaletti exercise

Figure 8. Hydrotherapy

Treatment outcome

The treatment follow-up was scheduled once a week to evaluate the treatment outcome. Subjective evaluation including lameness score (0-4) at stance, walk, and trot (Table 2) and pain score (1-5) were used. (Table 3)

The dog showed improvement of lameness score and pain score at the evaluation each week (Table 4), and completely restored the right leg function within 6 weeks. This was consistent with the owner's report that the dog had improved walking and running posture.

Table 2. Lameness score description

Lameness Score	Description		
	Stance	Walk	Trot
0	Normal stance	No lameness/weight-bearing on all strides ob-served	No lameness/weight-bearing on all strides observed
1	Slightly abnormal stance (partial weight-bearing)	Mild subtle lameness with partial weight-bearing	Mild subtle lameness with partial weight-bearing
2	Moderately abnormal stance (toe-touch weight-bearing)	Obvious lameness with partial weight -bearing	Obvious lameness with partial weight -bearing
3	Severely abnormal stance (holds limb off the floor)	Obvious lameness with intermittent weight -bearing	Obvious lameness with intermittent weight -bearing
4	Unable to stand	Full non-weight-bearing lame	Full non-weight-bearing lame

Table 3. Pain score description

Score	Clinical findings
1	No pain indicated on palpation of affected joint
2	Mild pain indicated on affected joint e.g. Animal turns head in recognition
3	Moderate pain on palpation of affected joint e.g. Animal pulls limb away
4	Severe pain on palpation of affected joint e.g. animal vocalizes or become aggressive
5	Animal will not allow examiner to palpate joint due to pain

Table 4. Lameness and pain evaluation of the right hind leg at each week of the follow-up

Week	Lameness score (0-4)			Pain score (1-5)
	Stance	Walk	Trot	
Before treatment	4	4	4	4
Follow-up week 1	2	2	3	2
Follow-up week 2	1	1	2	2
Follow-up week 3	0	1	1	1
Follow-up week 4	0	0	1	1
Follow-up week 5	0	0	1	1
Follow-up week 6	0	0	0	1
Follow-up week 7	0	0	0	1
Follow-up week 8	0	0	0	1
Follow-up week 9	0	0	0	1
Follow-up week 10	0	0	0	1
Follow-up week 11	0	0	0	1
Follow-up week 12	0	0	0	1

Discussion

Femoral head and neck excision is widely accepted for surgical treatment of hip luxation, however, the leg function takes some time after surgery to recover due to chronic pain and muscle atrophy.

Rehabilitation therapy necessary for restoration of mobility used in this study included treatment with laser class 4 to reduce pain, exercise and hydrotherapy to enhance muscle and joint function, and use of neutraceutical treatment, PCSO-524®.

The right leg function of the dog was continuously resumed after the surgery and completely restored within 6 weeks. This study demonstrated that **the use of neutraceutical supplement for multimodal treatment** is an effective choice for restoration of musculoskeletal function.

Conclusion

The study demonstrated that **long-term use of PCSO-524®**, which contains high amount of **omega-3** and **omega-6**, is effective for treatment of inflammation and restoration of dog mobility without causing any adverse effects. It is safe for consumption since it is extracted from natural substance, New Zealand Green Lipped mussels, and can be used as a major medication or in conjunction with other choices of treatment.

Acknowledgement

The author would like to thank the dog owner for restrictively following veterinarian's instruction and allowing publication of the data.
Also thanks to Orthopedics and Rehabilitation unit of Animal Hospital,
Kasetsart University Bang Khen Campus for the collaboration on the case study.

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2020

Case Report

Use of PCSO-524® (Antinol®) and Casting for Treatment of Tetraparesis and Neck Pain Due to Atlantoaxial Instability and Subluxation of the 1st-2nd Cervical Vertebrae

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Use of PSCO-524® (Antinol®) and Casting for Treatment of Tetraparesis and Neck Pain Due to Atlantoaxial Instability and Subluxation of the 1st - 2nd Cervical Vertebrae

Anyamany Chouybumrung, DVM
Spine and Neurology Center, PraRam 9 Thong Lor Animal hospital

Abstract

A 7 months old male Pomeranian dog was admitted to Thong Lor animal hospital for signs of intermittent leg paresis and hyperesthesia during the past 2 weeks.

Physical examination found grade II tetraparesis, neck hyperflexion, spasm of cervical muscle, and cervical hyperesthesia.

X-ray examination showed atlantoaxial instability and dorsal subluxation of the first and second cervical vertebrae. **The disease is congenital and commonly found in toy breed dogs** (Itoh H. et al, 2017).

A cast was used to stabilize the joints for 12 weeks in conjunction with medicinal treatment including pain killer medicine, gabapentin, and 1 capsule of PSCO-524® (Antinol®) sid.

After one week of the treatment, the dog showed no sign of pain when touched but the signs of hind limb paresis still remained. The treatment was continued until the 10th week that **gabapentin was terminated** and no recurrence of pain was detected since then.

After 12 weeks of the treatment, the cast was removed and PSCO-524® (Antinol®) 1 capsule sid was continued and the dog did not show any progressive development of clinical signs.

Keywords: Atlantoaxial instability, dog, small breed, PSCO-524®, Antinol®, tetraparesis, hyperesthesia, congenital, dorsal subluxation

Introduction

Atlantoaxial subluxation of the first two cervical vertebrae, atlas and axis, is the joint instability caused by developmental disorder of the second vertebra (dens).

The developmental disorder can be of various types such as hypoplasia, aplasia, non-union of the dens with the axis, incomplete ossification of the atlas (Thomas et al, 1991), and tissue trauma of the cervical spine. **It is mostly found in small breed dogs**, especially the young ones, and was first report in 1967 by Gary et al.

The most common form of the disease is dorsal luxation. X-ray imaging of cervical vertebrae is commonly used for diagnosis of the disease and computer x-ray and magnetic resonance imaging (MRI) can be used for further examination of the tissues in the area. Neurological symptoms usually found include neck pain, cervical hyperesthesia, neck hyperflexion, and paresis. The symptoms are the results of spinal cord injury due to dislocation of the dens that causes compression on the spinal cord. The instability of the cervical spine results in excessive movement that causes even more damage to the spine.

The treatment can be categorized as **conservative management and surgical treatment**. Surgery is the treatment of choice, especially in dogs that do not respond to conservative treatment and dogs that show severe neurological disorder. The treatments are aimed to increase stabilization of the first and second cervical vertebrae to delay the progress of spinal injury, and in some cases, able to restore normal function of the spinal vertebrae.

Case history

A 7 years old male Pomeranian dog weighed 1.2 kilograms had a history of patella luxation of both knees and history of pain killer administration. The dog was admitted to Thong Lor animal hospital for intermittent signs of lethargy, leg paresis particularly the hind limbs and cry out in pain when touched during the past 2 weeks. The dog was vaccinated accordingly to veterinary pregram, raised in a closed system and had no history of any illness or accident.

Physical examination

The dog was alert, responsive to environmental stimuli, had normal lung and heart sound, normal vital signs, and no injury had been found. The dog showed no signs of leg injury but grade II medial patellar luxation was found.

Laboratory results showed normal complete blood count and blood chemistry parameters. Neurological examination found that the dog had ambulatory walking paresis of all 4 legs with negative proprioception of the hind legs, normal patellar reflex and flexor reflex, positive deep pain perception of all 4 legs, neck heperflexion, spasm of cervical muscle, neck hyperesthesia, and normal cranial nerve function.

The dog was then diagnosed with grade II tetraparesis of which the lesion was located at C1-C5.

Diagnosis

The dog was further examined using radiographic imaging of C1-C7 and the results showed spinal disorders including dorsal subluxation of the second cervical vertebra and excessive gap between spinous process of the atlas and axis that is commonly found in atlantoaxial instability (Figure 1).
Dens aplasia of the second vertebra was also suspected.

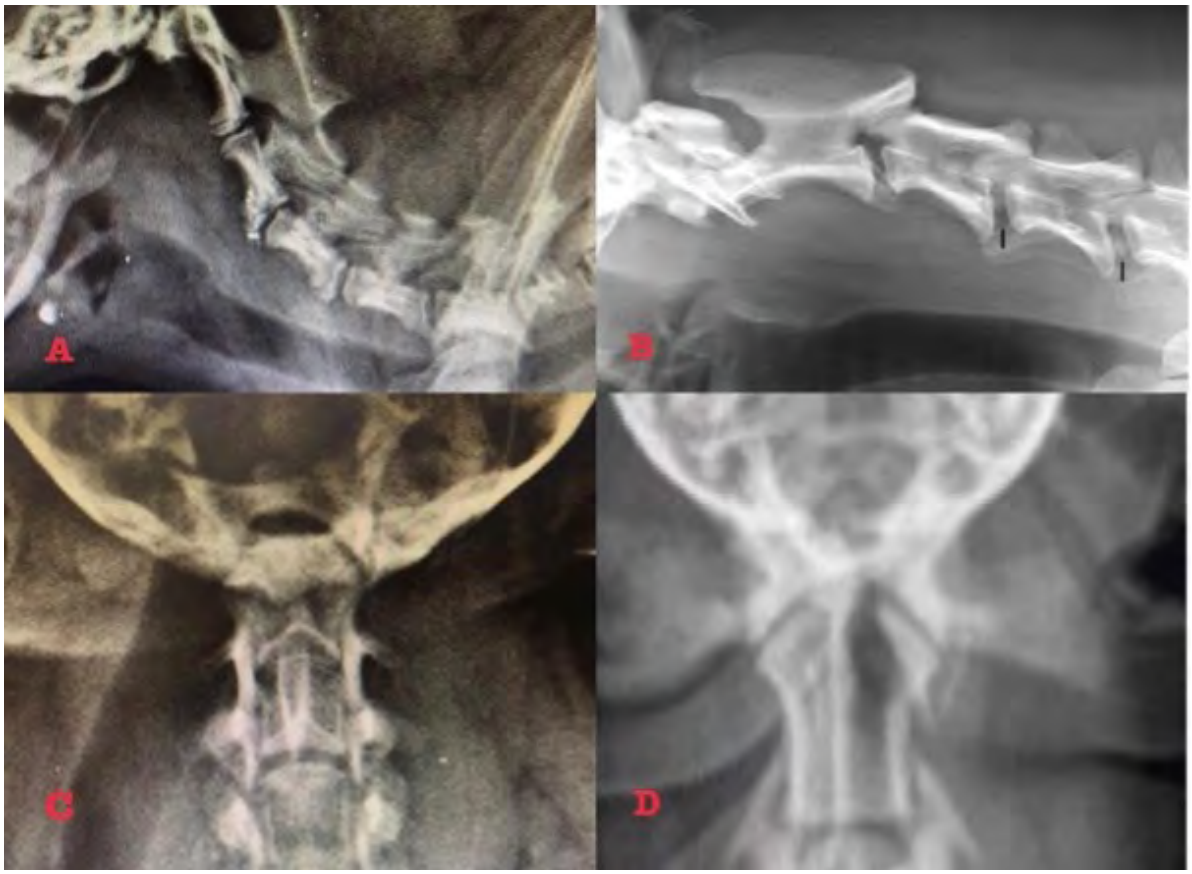

Figure 1. Radiographic images of cervical spine (C1-C7); A: dorsal subluxation of the axis and excessive gap between spinous process of the atlas and axis, B: normal cervical vertebrae, C: no dens were found in the image, D: normal cervical vertebrae

Treatment

There are 2 steps designed for the treatment as follows;

1. Stabilization:
Cast of the neck was used to restore normal position of the cervical vertebrae and to minimize the movement of the neck for 12 weeks.
The cast was changed every 1-2 weeks.

2. Medical treatment:
The dog was given a prescription including gabapentin 10 mg/kg bid to control neuropathic pain
and PSCO-524® (Antinol®) 1 capsule per day to reduce the inflammation.

Treatment outcome and Follow up

Week 1: Decreased severity of neck pain was observed but the dog still occasionally showed signs of hyperesthesia. Degree of the neck hyperflexion was decreased but the signs of grade II tetraparesis remained the same. PSCO-524® (Antinol®) and gabapentin were continued in order to reduce inflammation from the secondary injury. The follow up and changing of the cast was scheduled every 1-2 weeks.

Week 3: The dog showed improvement and no signs of hyperesthesia was observed. The neck hyperflexion was nearly disappeared and the dog showed ambulatory walking paresis without knuckling when walked. The neck cast remained installed and the medication was continued with PSCO-524® (Antinol®) and gabapentin.

Week 5-8: The clinical signs were stable with no signs of hyperesthesia. The neck hyperflexion was nearly disappeared and the dog showed ambulatory walking paresis without knuckling when walked. The neck cast remained installed and the medication was continued with PSCO-524® (Antinol®) and gabapentin.

Week 10: The clinical signs were stable with no signs of hyperesthesia. The neck hyperflexion was nearly disappeared and the dog showed ambulatory walking paresis without knuckling when walked. The neck cast was continued with PSCO-524® (Antinol®) 1 capsule per day but gabapentin was terminated due to lack of pain for more than 6 weeks.

Week 12: All the signs were stable after gabapentin was stopped. Ambulatory walking paresis still remained. The cast was removed when PSCO-524® (Antinol®) 1 capsule per day was continued and limited activity was introduced this week.

Week 14: All the neurological signs were stable with remaining ambulatory walking paresis. No sign of excessive pain was observed. PSCO-524® (Antinol®) 1 capsule per day and limited activity were continued.

Presence: The dog was under monitoring after the cast and pain killer medication were removed from the treatment scheme. Since the dog was young and had little body weight, only medical treatment was considered at this period. Surgical treatment was recommended when the dog was full grown.

Discussion

Atlantoaxial subluxation of the first two cervical vertebrae is a neurological disorder that is commonly found in small breed dogs. It is caused by **instability of the cervical spines** that may be the result of congenital disorder or severe trauma of the cervical tissues. The disease mostly occurs in young animals, except for that caused by trauma or injury.

Clinical signs are various including neck pain, hyperesthesia and hyperflexion of the neck, limb paresis and grade III tetraparesis or above. Severity of the disease depends on body weight, angle of the bone movement, and severity of the spinal trauma.

Treatment of atlantoaxial subluxation consists of **conservative management and surgical treatment.** Approximately 50% of diseased dogs respond well to the use of neck cast and medical prescription, although orthopedic surgery for spinal realignment and stabilization is preferred since it directly eliminates the actual cause of the disease.

However, the surgical treatment is not always recommended due to the fact that affected animals mostly are young small breed dogs and sometimes have low body weight, which does not allow surgical process and the stabilization tools to be fully functional.

Conservative management is therefore an alternative to delay progression of neurological disorder while the dog health is recovering and getting ready for the surgery.

This study case started to show clinical symptoms when he was 7-months old and weighed only 1.2 kilograms. The small size of spine and the growth plate that was not fully developed prohibited possibility of surgical treatment.

Due to **limitation of using stabilization tools and low bone density**, a cast and PSCO-524® (Antinol®) were selected for treatment in this case. Several study reports show that PSCO-524® (Antinol®), which is consisted of omega-3 polyunsaturated fatty acids (omega-3 PUFAs), has **anti-inflammatory and pain control effects.**

The fatty acids, especially eicosapentaenoic acid (EPA) and eicosatetraenoic acid (ETA), are effective for **prohibition of the synthesis of leukotrienes and prostaglandins,** which are products of inflammatory mechanism in COX pathway (Whitehouse et al., 1997; Dugas, 2000; Murphy et al., 2002).

The use of PSCO-524® (Antinol®) in this case was aimed for reduction of inflammation and control the development of spinal lesion while the spinal cord was spontaneously recovering from the injury.

Table 1. Treatment scheme and the results of 14-weeks follow up

Week	Neck cast	Gabapentin	PSCO-524® (Antinol®)	Clinical signs
0	-	✓	-	Hyperesthesia, tetrapar-esis grade II
1	✓	✓	✓	Mild hyperesthesia, tetraparesis grade II
3	✓	✓	✓	Hind limbs weakness
5-8	✓	✓	✓	Hind limbs weakness
10	✓	✓	✓	Hind limbs weakness
12	✓	-	✓	Hind limbs weakness
Presence (14 +)	-	-	✓	Hind limbs weakness

Conclusion

The dog had atlantoaxial subluxation of the first two cervical vertebrae that caused neurological disorders including grade II paresis, neck hyperflexion, stiff neck, and hyperesthesia of the neck.

Surgical treatment using stabilization tools was not recommended in this case due to small body size of the dog and high risk of complications.

Conservative management using a neck cast and PSCO-524® (Antinol®) was designed for treatment in this case. The use of PSCO-524® (Antinol®) was for **controlling pain and inflammation of the spinal tissue.** The dog showed improvement since the first week of the treatment and was able to stop the pain medication in week 10.

The study showed that PSCO-524® (Antinol®) is an effective treatment for atlantoaxial instability and luxation when used with a neck cast in dogs that are not ready for surgical treatment.

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อันดับที่ 3
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อันดับที่ 1
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Case Report

Effect of One Year Treatment with PCSO-524® on Feline Dermatophytic Pseudomycetoma

Chanakarn Cheepborisuttikul, DVM
Tawatchai Animal Hospital

Antinol® (PCSO-524®)
Case Study Contest 2020

Effect of One Year Treatment with PCSO-524® on Feline Dermatophytic Pseudomycetoma

Chanakarn Cheepborisuttikul, DVM, Tawatchai Animal Hospital

Abstract

Feline dermatophytic pseudomycetoma is a fungal infection of the skin caused by dermatophytes (*Microsporum spp.*)

The diagnosis is based on histopathological test.
The infection causes clinical lesion and chronic inflammation of the skin.
Long-term treatment is necessary with antifungal agents and anti-inflammatory drugs are recommended in case of severe inflammation.

Due to anti-inflammatory and skin enrichment effects of PCSO- 524 (Antinol®), it is used for supportive treatment of feline dermatophytic pseudomycetoma in this case.

Administration of PCSO-524 (Antinol®) also reduces the risk of adverse effects from using other anti-inflammatory agents.

The use is simple and can reduce the dosage of other medications, particularly in difficult cats that do not cooperate with taking oral medicine.

Treatment outcome can be evaluated from physical examination, hematological and blood chemistry tests, and body weight gain.

Over one-year treatment period, there was no signs of side effects from the treatment, the blood test results were stable and the quality of life and social interaction between the cat and the owner was improved.

Keywords: Feline, Antinol®, PCSO-524, Dermatophytic pseudomycetoma

Introduction

Feline dermatophytic pseudomycetoma is an uncommon disease caused by dermatophytes, usually Microsporum canis. It is most common in Persian cats and characterized by fungal infection of deep dermal and subcutaneous layer of the skin. The fungi can enter dermis layer from wounded skin, such as bite wound, cause skin disorders and persist for a long time. Therefore long-term treatment may be required from 6 months to several years.

The medical treatment is antifungal agent such as griseofulvin, itraconazole, or terbinafine. Itraconazole is drug of choice and is licensed for dermatophytosis long-term use.

Non-steroidal anti-inflammatory drugs (NSAIDs) may be used to control the skin inflammation in case of severe skin damage, but not without the risk of side effects.

Nutraceutical is therefore introduced as an alternative to NSAIDs in order to minimize the impact of the side effects. In this case, PCSO- 524 (Antinol®) was selected mainly for its anti-inflammatory effects and there was no previous report of using PCSO- 524 (Antinol®) for treatment of skin infection in cats.

Case history

A 1-year old neutered, male, domestic short hair cat named SONG with body weight 5.3 kg was completely vaccinated and lived indoor with another cat.

SONG was bitten by a stray cat while wandering out of the house, causing a deep wound and injury to the subcutaneous tissue. The cat was taken to a hospital and was treated with wound dressing, laser, amoxicillin/clavulanic acid, and steroidal anti-inflammatory drug for 2-3 months. the wound was progressive in worsen condition.

Fine needle aspiration technique was used to collect sample for cytological test and the test results showed no abnormality cells. The cat was then referred to the hospital for treatment of chronic wound.

Physical examination

Physical examination and palpation of abdominal area found a firm and irregular nodule under the skin, fistula ulcerate at the dermis and subcutaneous layers with seropurulent discharge, granule material, and oil. No disorders of the other systems were observed.

Diagnostic plan and Results

Due to failure of empirical treatment in the case history, **surgical procedures** were required for diagnosis and treatment. Biopsy was used to collect tissue for histopathological examination and to differentiate the disease among saprophyte/dermatophyte infection, bacterial infection, pyoderma, and neoplasia. Hematological test was performed prior to and after the surgery and the cat was also tested for FIV and FeLV infection.

The microscopic examination of the specimen that was section of the skin mass revealed diffuse multifocal extensive fungal granuloma throughout fibrotic dermis. Each granuloma consisted of necrosis in the center, accumulation of large arthrospore, numerous fungal hyphae, infiltration of neutrophils, foamy macrophages and lymphocytes.

Hematological and blood chemical test found parameters within normal ranges and the test kit examination showed that the cat was FIV/FeLV negative (Table 1).

The final diagnosis was **feline dermatophytic pseudomycetoma caused by Microsporum spp**. Other identification techniques include wood's lamp, microscope, PCR, cytology, cell culture, and tissue culture.

Treatment outcome and Follow up

7th December 2018: Physical examination and blood analysis was performed (Table 1).
The cat was given wound dressing and scheduled for surgical treatment on the following day.

8th December 2018: The mass was surgically removed and biopsy for histopathological examination. The prescription after the surgery included cephalexin 25 mg/kg po bid 7 days and tolfenamic acid 4 mg/kg po sid for 3 days.

14th December 2018: The cat was diagnosed with dermatophytic pseudomycetoma caused by Microsporum spp. based on histopathology of the biopsied tissue.
Antifungal drug, itraconazole 10 mg/kg po sid was prescribed for 6 months.

16th December 2018: Suture stitches were removed. The wound healing was satisfied and progressing.

23rd December 2018: The wound condition was worsening so Antinol® 1 capsule po sid was added to the prescription to reduce the inflammation, chlorhexidine and nano spray were used for wound dressing.

The cat was scheduled once a month for alanine aminotransferase (ALT) examination to evaluate the liver damage. Silymarin 20 mg/kg po sid was given on the 15th of June 2019 due to mild increased level of ALT.

After 1 year of the treatment, the skin inflammation was improved (Figure 1 and 2).
The blood analysis showed normal parameters including ALT (Table 1 and 2).
The body weight was increased (Table 3) as well as the life quality and health in general, and the owner was satisfied with the treatment results.

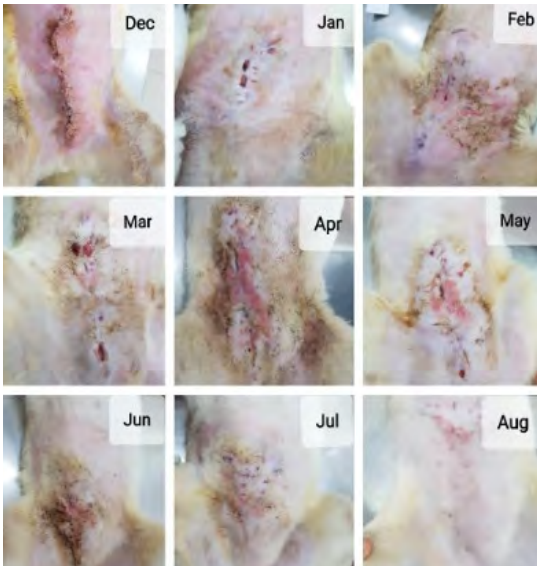

Figure 1. Skin lesion during December 2018 to August 2019

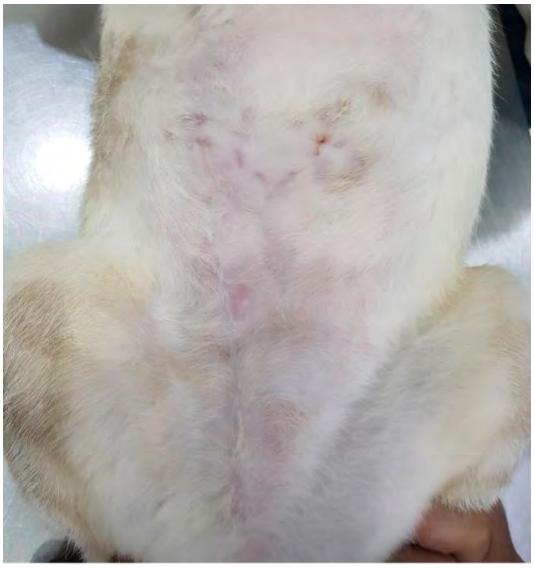

Figure 2. Skin lesion on November of 2019

The figures in December of 2018 showed severe inflammation of the skin, which gradually improved in August of 2019.

Table 1. Results of blood analysis during 1 year of treatment

DD/MM/YY Parameter	07/12/18	13/01/19	10/08/19	22/09/19	9/11/19	1/01/20	Ref. Range
WBC	23.0 H	19.6 H	20.1 H	24.4 H	19.7 H	21.4 H	5.5-19.5
Lymph (103uL)	4.9	3.1	7.0	3.4	4.9	8.0 H	0.8-7.0
Mono (103 uL)	1.3	1.6	1.3	2.8 H	2.0 H	1.3	0.0-1.9
Gran (103uL)	16.8 H	14.9	11.8	18.2 H	12.8	12.1	2.1-15.0
Lymph (%)	21.1	16.0	34.7	14.1	25.0	37.6	12.0-45.0
Mono (%)	6.0	8.4	6.8	11.4 H	10.0 H	6.0	2.0-9.0
Gran (%)	72.9	75.6	58.5	74.5	65.0	56.4	35.0-85.0
RBC (106uL)	7.43	6.28	7.93	7.99	8.50	8.13	4.60-10.0
HGB (g/dL)	13.9	11.5	12.1	11.8	12.1	12.0	9.3-15.3
HCT (%)	38.7	32.2	35.4	35.0	37.1	34.8	28.0-49.0
MCV (fL)	52.2 H	51.4	44.7	43.9	43.7	42.9	39.0-52.0
MCH (pg)	18.7	18.3	15.2	14.7	14.2	14.7	13.0-21.0
MCHC (g/dL)	35.9	35.7	34.1	33.7	32.6	34.4	30.0-38.0
RDW (%)	17.2	16.7	15.4	15.3	15.3	16.0	14.0-18.0
PLT (103uL)	408	418	386	261	298	245	100-514
MPV (fL)	10.5 H	10.3 H	11.3 H	9.9 H	10.7 H	9.6 H	5.0-9.0
PDW	15.8	15.8	15.7	15.4	15.4	14.9	-
PCT (%)	0.428	0.430	0.436	0.258	0.318	0.235	-
CRE (mg/dL)	1.54	0.75	1.7	1.52	1.6	1.3	0.3-2.1
ALT (U/L)	31.6	19.5	48.7	45.5	35	35	20-100

H indicates values above normal level

Table 2.
ALT level during January to June of 2019

Date (dd/mm/yy)	ALT (U/L)
15/02/19	25.3
15/03/19	34.1
20/04/19	26.0
18/05/19	76.1
15/06/19	93.4

Reference range: 20-100 U/L

Table 3.
Body weight of the cat during 1-year period

Month	Body weight (kg)
December 2018 (before surgery)	5.1
January 2019	4.65
April 2019	4.9
July 2019	5.3
October 2019	5.5
December 2019	5.6

Discussion

Feline dermatophytic pseudomycetoma is an uncommon disease and the treatment times requires various from up to 6 months to several years. Some cases do not respond to the treatment and some cases respond well in the beginning but the recurrence occurs.

There was a report in 8 years old cat that received a treatment for over 4 years including several surgical excisions and long term administration of griseofulvin/itraconazole/terbinafine.

There has never been a report of using PCSO-524® for feline dermatophytic pseudomycetoma prior to this report, However from this case study demonstrated the safety of PCSO-524® for long-term use without any side effects on cat and on blood parameters of this case.

Conclusion

The study showed that PCSO-524® is effective for control of inflammation and improve skin health and can improve life quality and body weight gain of fungal infected animals.

The active ingredients of PCSO-524® have anti-inflammatory effect since they inhibit the mechanism of action of COX and LOX enzyme. When the inflammation is controlled, then the skin lesion is improved. The lack of side effects on clinical signs and blood parameters of PCSO-524® when used for long-term treatment is demonstrated in the study.

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The Effectiveness of Marine Based Fatty Acid Compound (PCSO-524) and Firocoxib in the Treatment of Canine Osteoarthritis

BMC Veterinary Research (2019) 15:349

Authors: Monchanok Vijarnsorn, Irin Kwananocha, Narudee Kashemsant, Thitichai Jarudecha, Chalermpol Lekcharoensuk, Bruno Peirone, Brian S. Beale, B. Duncan X. Lascelles

This trial included 40 mixed breed dogs with x-ray confirmed Osteoarthritis split into four different treatment groups for four weeks.

This study suggests that **the combination of PCSO-524 and carprofen together was superior to other treatments for management of canine Osteoarthritis**. Results were seen in both objective and clinical assessment.

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