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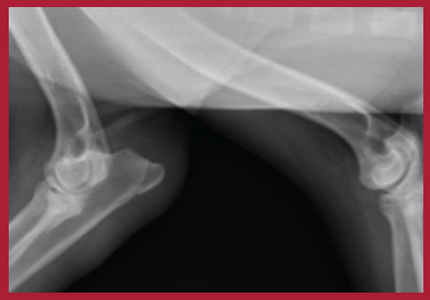

The Treatment of Medial Coronoid Disease in a Seven Months Old Labrador Retriever

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Abstract

Labrador retriever dog aged 7 months with history of right forelimb pain for 1 month was diagnosed as Medial Coronoid Disease (MCD) on both sides. Radiographic and Computed Tomography (CT) examinations found subtrochlear sclerosis on left elbow. Arthrotomy was operated on the dog using subtotal coronoid ostectomy technique on the medial side of both elbows. Long-term treatment included physical rehabilitation, and nutrition therapy including administration of PCSO-524® and glucosamine/chondroitin sulfate. The dog was followed-up for 6 months for orthopedic examination and assessment by force plate gait analysis. Two months after the operation, right forelimb could bear body weight, however left forelimb was still lame with lameness score of 1/4. Comparison of radiographic image showed that the left and right elbow was affected from moderate and mild osteoarthritis, respectively. Treatment success for MCD depends on early and accurate detection of the disease and appropriate treatment plan. Multimodal plan consisting of surgical treatment, medication, nutrition therapy and physical rehabilitation, is proposed.

Keywords:

Coronoid process, MCD, PCSO-524®, glucosamine, elbow dysplasia, gait analysis

Case history

Intact male Labrador Retriever dog aged 7 months was referred the veterinary hospital at Kasetsart University. The dog had suffered with pain of the right forelimb for 1 month. The dog exercised less due to pain. Non-steroidal anti-inflammatory drug;NSAIDs, was given daily for 7 days, discontinued for 7 days and repeat the step again. The clinical signs improved only during the week of medication. The dog still could not fully exercise.

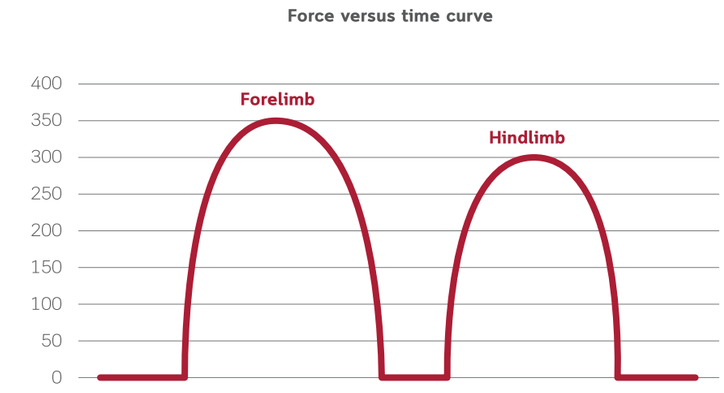

Figure 1.Force versus time curve: The peak of each curve is PVF of each limb when the foot touching the floor

Physical and orthopedic examination

The dog was cheerful, mucous membrane color was normal, no sign of dehydration, lung and heart sound was normal. There was pain of both forelimbs. When right forelimb touch the floor, head bobbing and lameness score of 3/4 was observed (Table 1 and VDO 1). Palpation examination found joint effusion of both elbows. The dog showed sign of pain and squealed when the elbows were extended or pressing on medial coronoid process of the elbows.

Table 1. Criteria for lameness score (5)

Clinical Signs	Score
Normal standing, walking and running	0
Normal standingbut showing slight pain when running	1
Normal standingbut showing slight pain when walking	2
Normal standingbut showing apparent pain when walking	3
Abnormal standing position and showing apparent pain when walking	4

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Diagnosis plan and Results

Force plate gait analysis

Measurement of weight bearing on the legs was performed using force plate. The dog was on leash and running pass the force plate at 1.9-2.1 m/s when peak vertical force (PVF) was recorded. Both forelimbs showed less PVF than the standard (107±9 to115±9 %body weight) (6) and the right forelimb showed less PVF than the left forelimb (Table 2).

Table 2. PVF from force plate gait analysis prior to the treatment

Date	Body weight (kg)	Velocity (m/s)	PVF (%body weight)			
			Right Forelimb	Left Forelimb	Right Hindlimb	Left Hindlimb
10/8/2016	24	24	62.4	68.62	93.88	94.33

Radiological diagnosis

Radiological examination of both elbows found mild sclerosis at both proximal ulna (Figure 2). Computed Tomography (CT) examination was used to confirm the diagnosis. CT examination identified radiolucent fissure line atmedial coronoid process of the right elbow and heterogeneous coronoid aspect andmild sclerosis at medial coronoid processof the left elbow (Figure 3). It was concluded that the dog had Medial Coronoid Disease (MCD) on both elbows. Additionally the lesion on left elbow had started to develop into DJD.

Treatment

Surgical treatment

One month after the first visit, arthrotomy was operated on the dog using muscle separationandsubtotal coronoid ostectomy technique at the medial side of both elbows.

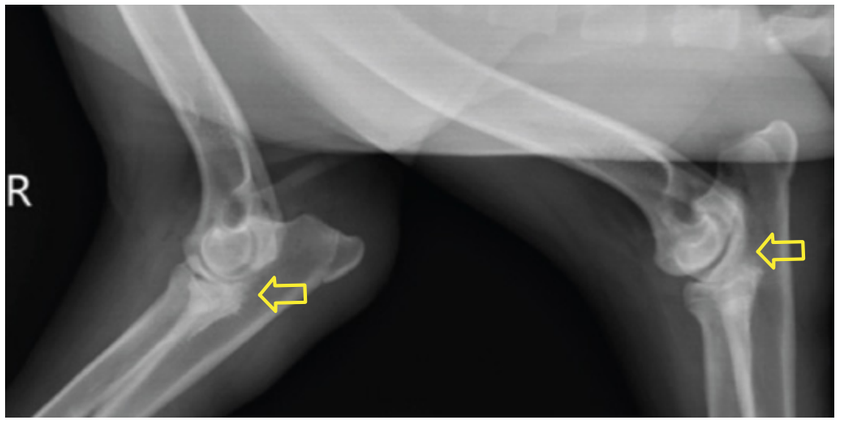
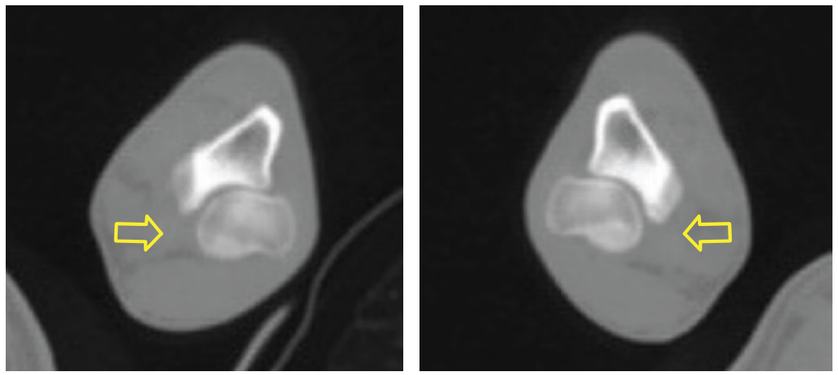


Figure 2. Extended lateral view of radiographic image showed mild sclerosis atproximal ulna of both elbows (arrows)



Left elbow

Right elbow

Figure 3. Left elbow: heterogeneous coronoid aspect and mild sclerosis of the medial coronoid process (dotted arrow). Right elbow: Radiolucent fissure line of the medial coronoid process (solid arrow).

Physical rehabilitation

Post-operative care:
- Cold compression on both elbows 15 minutes per day for 3 days
- Exercise limitation during the first week post operation

Seven days post operation:
- Ultrasonography massage on both elbows once a week for 4 weeks
- Continuous walking on leash 15-30 minutes per day

Two weeks post operation:
- Continuous weekly swimming

Two months post operation:
- Laser (class IV) stimulation on left elbow once a week for 4 weeks

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Medication

Prior to operation:
- PCSO-524® 2 capsules per day for 1 month

Post operation:
- Cephalexin 25 mg/kg bid for 7 days
- Carprofen (Rimadyl®) 2.2 mg/kg bid for 7 days and when in pain
- PCSO-524® 2 capsules per day continuously
- Glucosamine/chondroitin sulfate (Synoquin®) 2 tablets per day for 1 month then 1 tablet per day continuously

Result and Follow up

Two months after the operation, the dog remained showing sign of pain on left forelimb. The dog exercised more often, walking and running was improved. Physical examination showed head bobbing when left forelimb touching the floor (VDO 2) and lameness score of 3/4. Palpation examination found sign of pain when left elbow was fully extended, however, no pain when pressing on medial coronoid process. Right elbow was normal. Examination by force plate gait analysis found that left forelimb showed PVF less than the standard while PVF of right forelimb was nearly normal (Table 3)

Table 3. PVF from force plate gait analysis prior to and after the treatment

Date	Body weight (kg)	Velocity (m/s)	PVF (%body weight)			
			Right Forelimb	Left Forelimb	Right Hindlimb	Left Hindlimb
10/8/2016	24	1.98	62.4	68.62	93.88	94.33
26/10/2016	31.15	2.07	92.65	77.08	87.96	86.1
18/2/2017	33.5	2.00	110.15	88.96	89.25	86.3

Six months after the operation, pain and lameness disappeared as observed by the owner. The dog was able to walk, run, or swim for 1 hour continuously. The owner decided to decrease swimming frequency to once every 2-3 weeks and terminate glucosamine/chondroitin sulfate at the fourth month after the operation. PCSO-524® was continued daily. Physical examination showed head bobbing of the dog when left forelimb touching the floor (VDO 3) and lameness score of 1/4. Palpation examination found no pain of the right elbow. The left elbow was still in pain when fully extended. Force plate gait analysis showed increased PVF of the left forelimb compared to that of the second month after operation. However, it was less than PVF of the right forelimb and less that the standard as well. The right forelimb PVF was at normal standard (Table 3).

Radiographic image taken 6 months after the operation showed moderateosteophyte formation at the medial condyle of humerus and medial coronoid process of left elbow. Mild osteophyte formation at the medial coronoid process of the right elbow was also found (Figure 4).

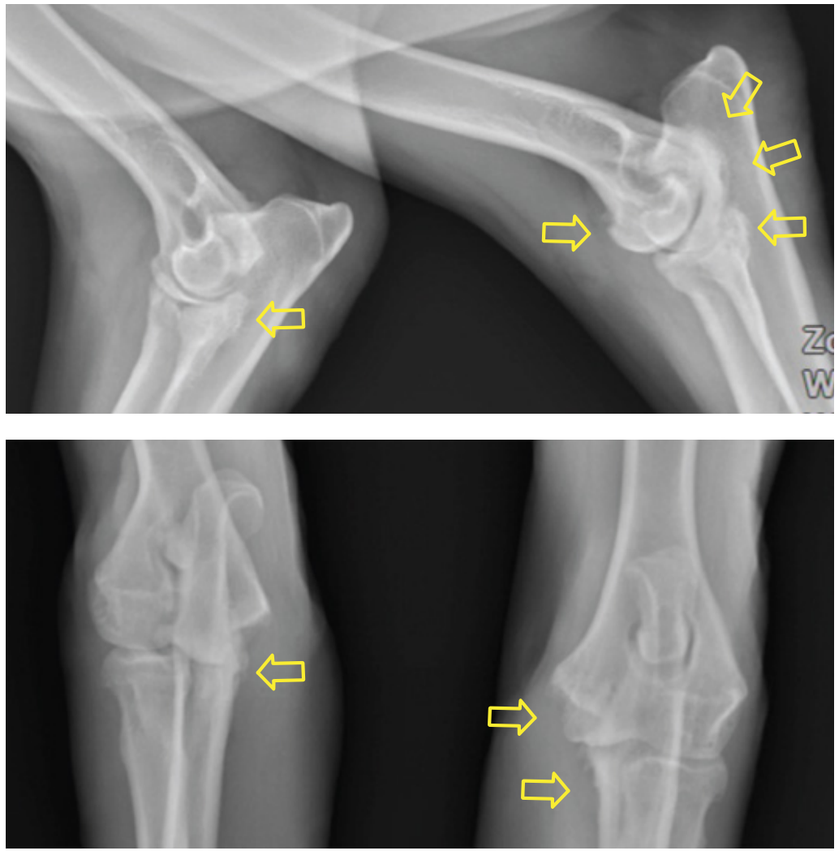

Figure 4. Top: Lateral view of elbow joint. Bottom: Anterior-posterior view of elbow joint. Moderate osteophyte formation was present on the left elbow at the medial condyle of humerus and medial coronoid process (dotted arrow). Mild osteophyte formation at themedial coronoid process was present at the right elbow (solid arrow)

Hematological examination did not find any abnormality during 6 months of the follow-up (Table 4).

Table 4. Comparison of hematological parameters prior to and 6 months after the operation

	9/8/2016	21/8/2017	27/10/2016	18/2/2017	Unit
PCV	45.7	43.6	47.7	48	%
RBC	6.65	6.42	6.72	7.03	* 106/uL
MCV	68.8	68	71	68.28	fL
MCH	21.9	21	24.4	35.21	Pg
MCHC	31.9	30.9	34.3	24.64	g/dl
Platelet	241	202	198	200	* 103/uL
WBC	8.4	9.9	25.4	8.78	* 103/uL
BUN	-	-	-	11	mg/dl
Creatinine	1.15	0.91	1.1	0.9	mg/dl
ALT	38	28	68	57	U/L
ALK	-	-	-	51	U/L
Total protein	-	-	-	6.7	mg/dl
Albumin	-	-	-	3.7	mg/dl

Discussion

MCD is common in Labrador retriever dogs especially during the growing period.The most effective diagnosis is CT and arthroscopy. Conservative treatment may improve clinical signs of the disease but the most accepted treatment is operation to remove cartilageneous flap at the medial coronoid process. The operation can be arthrotomy or arthroscopy, which is regarded as non-invasive technique appropriate for both diagnosis and treatment.

Arthrotomy performed at the right elbow in this case resulted in better treatment outcome compared the left elbow. PVF of the right elbow was nearly normal within 2 months after the operation while pain remained on the left elbow for 6 months. Suspected cause of the difference is subtrochlear sclerosis of the left elbow that developed into early DJD prior to the operation. Although cartilage flap which was the cause of joint inflammation was removed, DJD still persisted. Early treatment before development of DJD with elimination of other factors that may cause leg pain, such as joint incongruency is the key for treatment success (7).

The dog received multimodal treatment consisting of operation, medication, nutrition therapy which was long-term use of (PCSO-524®),extract from New Zealand Green-lipped mussel, in combination with short-term glucosamine/chondroitin sulfate (Synoquin®) and continuous physical therapy.

Assessment of clinical signs suggested adjustment of treatment plan during the 6 months follow-up until the treatment satisfactory was met. The plan started from operation to remove cartilage flap that caused joint inflammation followed by reduction of inflammation using anti-inflammatory drugs; NSAIDs and physical rehabilitation. Additional nutrition therapy was used to reduce inflammation and supply substrate for cartilage development. During 6 months of follow-up, no adverse effects were observed from clinical signs and hematological examination.

The main ingredient of PCSO-524® is eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which is omega-3 fatty acid that can adjust the balance of omega-6 and omega-3 in the body. Omega-6 produces inflammation inducer substances, prostaglandins, thromboxanes series 2 and leukotrienes series 4, which induce severe inflammation. On the other hand, omega-3 produces ecosanoid of prostaglandins, thromboxanes series 3 a ndleukotrienesseries 5, which induce less inflammation. Supplementation of omega-3 therefore adjusts the balance by reducing omega-6 resulting in decreased inflammatory mechanism of the body (8, 9). PCSO-524® is consisted of eicosatetraenoic acid (ETA), omega-3 fatty acid of which structure is similar to arachidonic acid. It is possible that ETA binds with active binding site of enzymes that use arachidonic acid as substrate, therefore PCSO-524® has anti-inflammation effect (8, 10).

Glucosamine and chondroitin sulfate are amino monosaccharide that is substrate and component of glycoprotein proteoglycans and glycosaminoglycans (GAGs) in joint cartilage (11, 12). There are reports stating that glucosamine/chondroitin sulfate can prevent inflammation of articular membrane, stimulate cartilage metabolism, and prohibit cartilage degradation (13, 14).

DJD is a chronic inflammation on continuous development (15). It occurs when degenerative rate of the cartilage is higher that formation rate (16). Inflammation occurs in joint is the main factor that influence degeneration of the joint cartilage. Treatment of DLD essentially includes controlling of inflammatory process and promoting joint cartilage growth. Objective of physical rehabilitation is to restore muscle and joint so that they can properly function again. The dog in this case received physical rehabilitation that consisted of 1) Cold compression after operation in order to reduce blood circulation, oxidative metabolism, and muscle spasm. The result is to decrease inflammation and cartilage degeneration and the cold can relieve pain in targeted area. 2) Ultrasonography massage to generate deep heat at the elbow area. This will increase flexibility of connective tissue for better extension of joint. 3) Walking is to enhance body balance, muscle strength and endurance. 4) Swimming to strengthen muscle and cardiovascular system since the buoyancy helps support body weight of the dog and createsresistance when the dog moves. 5) Laser (class IV) beam to reduce pain and stimulate cartilage healing (17). Various techniques of physical rehabilitation were selected and applied at appropriate time period to maximize the treatment efficacy.

Acknowledgement

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