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Spondylosis Deformans: A Clinical Case in a Beagle

Elisabeth Karina[1] , I Putu Gede Yudhi Arjentinia[2] , I Gede Soma[2]

[1]Student of Veterinary Professional Program,
[2] Laboratory of Veterinary Internal Medicine,
Faculty of Veterinary Medicine, Udayana University,
Sudirman Street, Sanglah, Denpasar, Bali, Indonesia, 80234,
Tel/Fax: (0361)223791

Corresponding Author: yudhiarjentinia@unud.ac.id

Abstract. Spondylosis is a degenerative disorder that causes abnormalities in the normal structure and function of the spine. A Beagle dog named Poby with female sex, *tricolor* color, 7 years old, weighing 18 kg came with complaints of sudden paralysis from one month ago before examination, the dog had difficulty passing stool so that the stomach was enlarged. Both eyes were droopy and sometimes red. Digestion examination an enlarged abdomen and when percussed there was a muffled sound and palpation urinary examination showed distension of the urinary vesica. The musculoskeletal examination showed that the case dog had muscle atrophy in both front legs and hind legs, the movement of both front legs and both hind legs was stiff, the muscle tension was weak, there was an uncomfortable reflex when palpated in the lumbar region, along with the neurological examination the dog had tetraplegia, there were no patellar reflexes, biceps, triceps, flexors, extensors on the right front and hind legs. Eye examination showed the *nictitating membrane of* the eye was up and the dog's eye was red. X-ray examination showed osteophytes in lumbar Os II-V, distension of the urinary vesica and accumulation of feces in the colon. The results of the CBC examination were that the case dog had mild lymphocytopenia, mild hypochromia, and hyperglycemia. The case dog was diagnosed with spondylosis. Treatment was carried out by administering Prednisone and acupuncture therapy. After the 50st day of treatment, the dog's condition improved.

Keywords: dog, osteophytes, spondylosis

I. INTRODUCTION

Spondylosis deformans is a common degenerative disorder of the spine. It affects the vertebral bones of the spine and is characterized by osteophytes that form along the bottom and edges of the vertebrae of the spine. The bone growths may occur at a single point on the spine or at multiple locations. In dogs, the most commonly affected area is the lumbar vertebrae, or the lower back around the hips. Sometimes, the bone growth can be large enough that it appears

to form a complete bridge from one vertebrae bone to the next, fusing or connecting the vertebrae. This condition causes non-inflammatory and irreversible damage to the spine, which can result in loss of function and mobility problems [13].

Spondylosis is classified from its location as *cervical spondylosis*, *cervicothoracic spondylosis*, *thoracic spondylosis*, *thoraco-lumbar spondylosis*, *lumbar spondylosis*, *lumbo-sacral spondylosis*. There are five stages of osteophyte development. Stage one describes the earliest gross findings, which are *palpable nodules* that are not identified on macroradiographs. The changes are located over the intervertebral spaces and edges of adjacent vertebrae and are up to 5 mm in diameter. The second stage consists of small osteophytes on the vertebral edges these are the earliest changes visible radiographically. Stage three is characterized by larger bony projections with a cup-like shape but without extension beyond the vertebral end plates. Stage four is identified by the tip of the osteophyte extending beyond the edge of the vertebral body ventrally and/or laterally. There is no union between opposing osteophytes. *Radiopaque* crescent-shaped or unattached triangles. Segments found within the ventral anular tissue fall into this category. At stage five, bone fusion has occurred between the opposing osteophytes. If more than one osteophyte is located at the edge of the vertebral end plate (Figure 1).

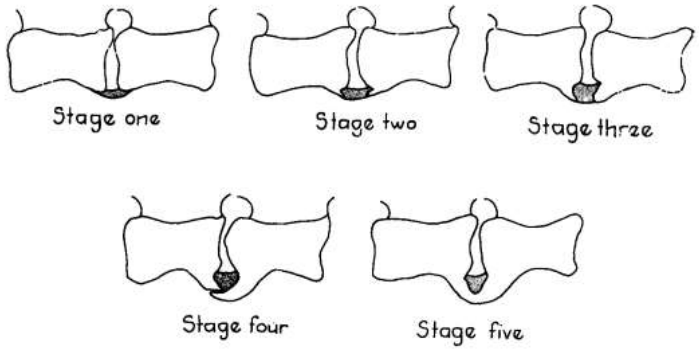

Figure 1. Five stages used in viewing the size and shape of grossly and macroradiographically determined vertebral osteophytes. The first stage can only be roughly identified because it contains soft tissue [14].

Many clinical signs can be associated with spondylosis, including back stiffness, weakness, gait changes, and pain [2]. Clinical signs that may be present in cases of *lumbar spondylosis* include hip weakness and/or ataxia, difficulty with urination and defecation, sensory system disturbances and pain in the caudal region of the body, weak or immobilized tail, paraparesis and weak flexor reflexes of the hindlimb muscles [4]. The extent of lesion development depends on age, with severe lesions usually found in older dogs [8]. The diagnosis of spondylosis is based on the dysfunction that occurs in the vertebral region combined with radiologic examination. Radiologic examination is the most accurate examination in diagnosing spondylosis by looking at the changes that occur in the vertebral joints [17].

This case report aims to learn more about spondylosis in dogs and provide information that the clinical signs of sudden paralysis, both eyes dropping, and difficulty passing stool indicate a disorder, so an examination should be carried out in order to get the right treatment.

II. MEDICAL RECORD

Signalement

A Beagle dog named Poby, female, tricolor (brown, white, black), 7 years old, weighing 18 kg.

Anamnesis

The examination of the dog Poby was conducted on Tuesday, March 28, 2023 at the owner's house Jl. Danau Tamblingan, Denpasar, Bali. The case dog had a complaint suddenly paralyzed from one month ago until now, since paralysis occurred the dog had difficulty removing feces so that the stomach was enlarged. Both eyes of the dog are droopy and sometimes red. The owner has two female Beagle dogs of the same age and none of them show the same symptoms. According to the owner, apart from these symptoms the case dog did not show any other symptoms of illness. The dog is active, has normal appetite and drink, has been given vaccines and dewormed. Since the appearance of these symptoms, the dog has been taken to the previous doctor and given acupuncture therapy but there was no progress. The food given is dry food.

The dog is kept in a cage and released in the yard in the afternoon.

Physical Examination

Examination of Poby was conducted on Tuesday, March 28, 2023 at the owner's house on Jl. Danau Tamblingan, Denpasar, Bali. The dog had a *Body Condition Score of* 5/5, calm temperament and immobile *habitus*. Preassessment status is presented in Table 1.

Digestion examination shows abnormal results, namely when palpated, the case dog has an enlarged abdomen and when percussed, a muffled sound appears, which means that there are solid objects which here lead to feces, and urinary examination when palpation of the abdominal area shows a distension of the urinary vesica. The musculoskeletal examination showed abnormal results, namely the case dog had muscle atrophy in both front legs and hind legs, movement of both front legs and both hind legs was stiff, muscle tension was weak, there was an uncomfortable reflex when palpated in the lumbar region (Table 2), along with neurological examination the dog had tetraplegia, no patellar reflex, biceps, triceps, flexors, extensors on the right front and hind legs. The eye examination showed abnormal results, namely the membrane nictitant in the eye rose and the dog's eyes were red.

Table 1. Poby Dog Preassessment Status Check Results

No.	Type of Inspection	Results	Referral Value [19]	Description
1	Body temperature (℃)	38,4	37,8-39,5	Normal
2	Heart Rate Frequency (times/minute)	106	60-160	Normal
3	Pulse Frequency (times/minute)	106	76-128	Normal
4	Respiration Frequency (times/minute)	24	20-30	Normal
5	*Capillary Refill Time* / CRT (seconds)	<2	<2	Normal

Table 2: Examination of musculoskeletal conditions in the *lateral recumbency* position

Finding [9]	**Musculoskeletal**
Muscle atrophy	+
Muscle enlargement	-
Joint thickening, enlargement, heat	-
Decreased joint range of motion	+
Crepitus	-
Synovial popping	-
Joint ligamentous instability	-
Hyperreflexia	-
Hyporeflexia	+
Absence of deep pain	-
Pain/discomfort during joint manipulation	
Hip - Extension	-
Hip - Abduction	-
Tail base extension	-
Pain/ discomfort during bone manipulation	
Long bones	-
Spine/cervical column	+

Description: Presence of reflex (+), absence of reflex (-)

Table 3. Neurological examination [18]

Visual Observations	**Description**
Mental status	Normal
Behavior	Normal
Posture	Normal
Gait	Tetraplegia
Postural Reactions	
Proprioception	0
Hopping	0
Wheelbarrow	0
Hemiwalking	0
Visual placing	0
Tactile placing	0

Extensor postural thrust	0
Sensation	
Superficial pain	Normal
Spinal Reflexes	
Flexor (front)	
Biceps	0 (right forefoot)
Triceps	0 (right forefoot)
Patellar	0 (right forefoot)
Flexor (rear)	
Gastrocnemius	0 (right hind leg)
Cranial tibial	0 (right hind leg)
Crossed extensor	0 (right hind leg)
Cutaneous trunchi	2
Lumbosacral Reflexes (L6-S3)	
Anal tone/ perineal sensation	1
Tail tone	2
Palpation	
Cervical spine	0
Thoraolo spine	0
Lumbar spine	0
Sacral spine	0
Cranial Nerves	
Olfactory (I)	2
Menace response	2
Optic (II)	2
PLR (III) - direct	2
Palpebral (V,VII)	2
Facial symmetry	2
Jaw tone/ Temporalis m (V)	2
Oculocephalic (III, IV, VI, VII)	2
Gag (IX, X)	2
Spinal accessory (XI)	2
Tongue (XII)	2

Description: absent (0), decreased (1), normal (2), increased (3), chronic (4)

Figure 2. Documentation of the condition of the case dog. (Left) showing abdominal enlargement; (Right) showing raised membrane nictitans in both eyes and redness.

Laboratory Examination

On X-ray examination with the right lateral recumbency position, bone spurs were seen in the lumbar Os II-V. There was distension of the urinary vesica and accumulation of feces in the colon. There were no other organ abnormalities in the dog's body (Figure 3). The results of the CBC examination were that the case dog had a mild decrease in lymphocyte values, a mild decrease in MCHC values, an increase in glucose values (Table 4) which can be interpreted that the dog had mild lymphocytopenia, mild hypochromia, and hyperglycemia.

Figure 3. X-ray results of the patient in lateral position. There are osteophytes in lumbar Os II-V; *bone spur score* 3 in lumbar Os II-IV is characterized by larger bone projections with a cup-like shape but without extension beyond the vertebral end plates (blue box); *bone spur score* 2 in lumbar Os V is seen from small osteophytes on the vertebral edges (yellow box) (Nathan, 1962). There is distension of the urinary vesica (yellow arrow) and accumulation of feces in the colon (black arrow). There are white patches on the dog's lungs (green arrows). There are no other organ abnormalities in the dog's body.

Table 4. *Complete blood count* and biochemical examination results of case animals

Parameters	Unit	Results	Referral Value*	Description
WBC	10 /l^9	7.90	6.00-17.00	Normal
Lymphocytes	10 /l^9	0.98	1.00-4.80	Declining
Monocytes	10 /l^9	0.71	0.20-1.50	Normal
Neutrophils	10 /l^9	6.14	3.00-12.00	Normal

Eosinophils	10 /l^{9}	0.05	0.00-0.80	Normal
Basophils	10 /l^{9}	0.03	0.00-0.40	Normal
RBC	10 /l^{12}	6.14	5.50-8.50	Normal
HGB	g/dl	12.3	12.0-18.0	Normal
HCT	%	43.50	37.00-55.00	Normal
MCV	fl	71	60-77	Normal
MCH	pg	20.1	19.5-24.5	Normal
MCHC	g/dl	28.3	31.0-39.0	Declining
PLT	10 /l^{9}	361	165-500	Normal
MPV	fl	7.5	3.9-11.1	Normal
PCT	%	0,27		Normal
ALP	U/L	93	20-150	Normal
ALT	U/L	57	10-118	Normal
BUN	mg/dL	20	7-25	Normal
CRE	mg/dL	0.8	0.3-1.4	Normal
GLU	mg/dL	146	60-110	Increased
TP	g/dL	7.5	5.4-8.2	Normal

*Source: HM 5 machine from Abaxis.
Notes:
WBC (*White Blood Cell*); RBC (*Red Blood Cell);* HGB (*Hemoglobin*); HCT (*Hematocrit);* MCV (*Mean Corpuscular Volume);* MCH (*Mean Corpuscular Hemoglobin*); MCHC (Mean Corpuscular *Hemoglobin Consentration)*; PLT (*Platelet/Thrombocyte*); MPV (*Mean Platelet Volume)*; PCT (*Procalcitonin*); ALP (*alkaline phosphatase);* ALT (*Alanine aminotransferase);* BUN (*Blood Urea Nitrogen);* CRE (*Creatinine);* GLU (*Glucose*).

Diagnosis and Prognosis

Based on the anamnesis, physical examination, and confirmed by the results of supporting examinations, the dog was diagnosed with lumbar spondylosis with a dubius infausta prognosis.

Therapy

The therapy given to the case animal consists of corticosteroid anti-inflammatory as symptomatic therapy, and acupuncture accompanied by physiotherapy as medical therapy. Symptomatic therapy to overcome inflammation or inflammation in the condition of the dog's nervous system is by giving anti-inflammatory corticosteroid Prednisone for 50 days with a gradual reduction, the first day to the third day is given twice a day with a dose based on the dog's body weight of 1 tablet 0.5-1mg/ kg BW per oral (PO). Furthermore, one administration is done in one day from day four to 10. On day 10 - day 50, one administration is done in one day ½ tablet (PO). Dogs were treated with medical

therapy, namely acupuncture three times a week accompanied by physiotherapy exercises (Figure 4).

Figure 4. Acupuncture therapy on case dog

III. DISCUSSION

Spondylosis is a disorder characterized primarily by the presence of osteophytes at the borders of vertebral bodies in the intervertebral space. They range in size from small individual projections to complete bony bridges between adjacent vertebral bodies and may also involve other parts of the vertebrae [11]. Spondylosis has several potential causes. Although the disease is degenerative and correlates with aging in dogs as well as other mammals, it can also be caused by mechanical stress, triggered by trauma, stress on ligaments and periosteum associated with activity, disc degeneration, or muscle weakness [15]. *Lumbar spondylosis is* seen with bone and soft tissue changes that have stenosis of the spinal nerve canal at the lumbar vertebrae Os I to Os sacrum I. The lumbar Os has a much larger spine to absorb pressure when lifting and carrying heavy objects. Injury to the lumbar region can cause loss of hip, leg, and *bladder control* function [7].

On clinical examination the case dog had paraplegia in all four extremities, vesical urinary distension, accumulation of feces in the colon. Clinical signs observed on clinical neurological examination included muscle atrophy in both forelimbs and hindlimbs, stiff

movements of both forelimbs and hindlimbs, weak muscle tension, uncomfortable reflexes on palpation of the lumbar region, tetraplegia, no patellar, biceps, triceps, flexor, extensor reflexes in the right forelimb and hindlimb. As in the study of Yasuda and Too (1983), the case of tetraplegia in dogs included muscle damage accompanied by muscle atrophy in both front and hind legs with long clinical symptoms with a chronic and non-progressive stage of neuropathy. Complete blood and biochemical examination showed mild decrease in lymphocyte count, mild decrease in MCHC count, and increase in glucose count. Radiologic examination (X-ray) showed osteophyte development at lumbar Os II-V. Distension of the urinary vesica and accumulation of feces in the colon were seen, resulting in the final diagnosis of lumbar spondylosis.

The presence of spondylosis in dogs depends on breed and age. Both of these factors can increase the workload on the spinal joints, which is a predisposing factor in this case. It is thought that hypermobility plays a role, damaging nerve tissue in the spinal cord [17]. Beagles aged seven years or older are more likely to develop spondylosis. Dogs over the age of seven years will continue to experience osteophyte development, especially in the lumbar region, although not significantly. As in the journal Morgan *et al*., (1989), the detection of osteophytes is age dependent with a marked increase in older dogs. However, the statement that all dogs will develop some degree of spondylosis by 10 years of age may apply to larger breeds but not to small breeds such as beagles [11]. It is possible that Poby's dog developed spondylosis because the dog was already seven years old.

There are five levels of osteophyte development [14]. These levels of severity can be seen on x-ray examination. Poby's spondylosis was grade 3 at lumbar os II-IV and grade 2 at lumbar os V (Figure 3). According to Nathan (1962), spondylosis of severity two is seen from small osteophytes on the vertebral edges. While spondylosis with severity three is characterized by larger bony projections with a cup-like shape but without extension beyond the vertebral end plates. Dogs with lumbar spondylosis will have degenerative, developmental, hypertrophic and/or proliferative lesions that cause stenosis of the nerve tissue

exiting the spinal cord. Poby's x-rays showed distension of the urinary vesica and accumulation of feces in the colon (Figure 3). According to Levine *et al*. (2006), injury to the lumbar region can cause loss of hip, leg, and *bladder control* function which can affect anal and urethral sphincter ability.

The differential diagnoses of lumbar spondylosis cases are osteoarthritis, lumbar disc herniation and intervertebral disc disease. These disorders have similarities in physical examination, and can be distinguished in supporting examinations such as radiology (x-rays, magnetic resonance imaging, CT scans, and myelographs) [17]. In the case of lumbar spondylosis, there are only structural changes due to the development of osteophytes and does not cause direct pressure on the spinal cord and spondylosis is a non-inflammatory disorder that does not involve the joints between the articular processes of the spine (interneural, vertebral, or intervertebral synovial joints) [12].

Prognosis of spondylosis caused by normal wear and tear on the ligament fibers that connect the Intervertebral dics to the end of the vertebral body. Stress and strain can cause microtears in these fibers and the body experiences instability and tries to compensate by making new bone at the ends of the vertebrae and "bridging the gap". *Bone spurs* can grow large enough to touch the ends of other new bone and form a bridge known as "bridging spondylosis". These bridges usually form along the spine in the thoracolumbar spine and most commonly along the lumbar spine. Due to various factors such as age, severity and duration of degeneration, overall health status of the dog, as well as the accuracy and effectiveness of treatment, it is expected that the dog will be able to walk normally again but will not be able to restore the lumbar spine to normal with a dubius infausta prognosis. Surgery can be performed to reduce pressure on the nerve channels and stabilize the spinal column such as lumbar surgery (Laminectomy) the cure rate reaches 78-93%. However, the age of the case dog needs to be weighed again in surgery [1].

In the case of Poby dogs, corticosteroid class anti-inflammatory prednisone is given to treat inflammation in the dog's nervous system and as an immune-suppressive [3]. Short-term use

of prednisone for dogs usually does not cause significant side effects. If they occur, they usually appear in the form of increased drinking and urination, panting, or increased appetite [10] which in this case helped in the recovery of defecation and urination to normal. Acupuncture therapy is performed to relieve pain and help the body to release *endorphins*, *norepinephrine*, and *anti-inflammatory mediators* that can make the body recover slowly naturally [5]. Exercise therapy is a technique used by physiotherapy to restore and improve muscle and bone conditions in patients [6]. The purpose of exercise therapy here is to increase muscle strength and increase functional ability.

Observation was done weekly for 50 days after examination and treatment. After two weeks of therapy, the dog could move the neck slightly and the *nictitating membrane* that rose in the dog's eyes had decreased, there was no redness in the eyes of the case dog. On the 21st day the dog could lift its neck normally in the dorsoventral position, and improvement in *postural reactions*, *spinal reflexes,* and *lumbosacral reflexes* accompanied by palpable strength in muscles in all extremities. On the 50th day after the provision of treatment and therapy, the dog can move and lift its neck well and can raise its own body from lateral to dorsoventral position.

Evaluation of the case dog on day 14 after the administration of symptomatic therapy along with *acupuncture*, the dog could move the neck slightly and the *nictitating membrane* rising in the dog's eyes had decreased, there was no redness in both eyes of the case dog. On the 21st day after treatment, the dog could lift its neck normally in the dorsoventral position, and improvement in *postural reactions*, *spinal reflexes,* and *lumbosacral reflexes* accompanied by palpable strength in muscles in all extremities. On the 50th day after the provision of treatment and therapy, the dog can move and lift its neck well and can raise its own body from lateral to dorsoventral position.

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Figure 5. (A) The case dog was able to raise its neck on the 21st day after treatment; (B) the case dog could move and raise its neck well and could raise its own body.

Table 5. Examination of musculoskeletal conditions with *lateral recumbency* after treatment

Finding [9]	**Musculoskeletal**
Muscle atrophy	-
Muscle enlargement	-
Joint thickening, enlargement, heat	-
Decreased joint range of motion	-
Crepitus	-
Synovial popping	-
Joint ligamentous instability	-
Hyperreflexia	-
Hyporeflexia	+
Absence of deep pain	+
Pain/discomfort during joint manipulation	
Hip - Extension	-
Hip - Abduction	-
Tail base extension	-
Pain/ discomfort during bone manipulation	
Long bones	-
Spine/cervical column	+

Description: Presence of reflex (+), absence of reflex (-)

Table 6. Neurological examination [18] after treatment

Visual Observations	**Description**
Mental status	Normal
Behavior	Normal
Posture	Normal
Gait	tetraplegia

Postural Reactions	**(0-absent, 1- decreased, 2- normal)**
Proprioception	1
Hopping	0
Wheelbarrow	0
Hemiwalking	0
Visual placing	1
Tactile placing	1
Extensor postural thrust	0
Sensation	
Superficial pain	Normal
Spinal Reflexes	**(0-absent, 1- decreased, 2- normal)**
Flexor (front)	
Biceps	2
Triceps	2
Patellar	2
Flexor (rear)	
Gastrocnemius	2
Cranial tibial	2
Crossed extensor	2
Cutaneous trunchi	2
Lumbosacral Reflexes (L6-S3)	**(0-absent, 1-decreased, 2-normal, 3-increased, 4-chronic)**
Anal tone/ perineal sensation	2
Tail tone	2
Palpation	
Cervical spine	2
Thoraolo spine	2
Lumbar spine	2
Sacral spine	2
Cranial Nerves	**(0-absent, 1- decreased, 2- normal)**
Olfactory (I)	2
Menace response	2
Optic (II)	2
PLR (III) - direct	2
Palpebral (V,VII)	2
Facial symmetry	2
Jaw tone/ Temporalis m (V)	2
Oculocephalic (III, IV, VI, VII)	2
Gag (IX, X)	2
Spinal accessory (XI)	2
Tongue (XII)	2

Description: absent (0), decreased (1), normal (2), increased (3), chronic (4)

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Figure 6. Neurological examination results in the Poby case dog. (A,B. *Paw Replacement*; C,D. *Hopping*; E. *Wheel Barrowing*; F. *Extensor Postural Thrust;* G. *Hemiwalking*; H. *Biceps reflex;* I. *Triceps reflex*; J. *Patella reflex;* K. *Gastrocnemius reflex*; L,M. *Withdrawal reflex*; N. *Cutaneous trunci reflex*).

It is necessary to educate owners about the importance of monitoring dog activity and paying attention to dog weight to prevent injuries that can affect the spine in dogs, especially senior dogs. And for further research, other treatments can be added along with more varied support such as MRI or CT scans.

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