

Evaluation of Diseases Affecting Hindlimb Lameness in Domestic Small Breed Dogs

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Abstract : Lameness is a variation of normal gait in an animal, and it means that one or more limbs cannot be used correctly to allow the animal to walk. In the usual context, the incidence of hindlimb lameness in dogs is most likely the result of trauma, joint diseases, and/or congenital diseases. Generally speaking, the factors influencing hindlimb lameness include the animal's specific breed, size, weight, and whether it engages in frequent or strenuous activities. Many studies have investigated the incidence of lameness of large breed dogs, as compared to small breed dogs. Considering that many domestic dogs are small breeds, the lameness of small breed dogs with a high population in Korea was evaluated. The major causes of hindlimb lameness were found to be joint, musculoskeletal, and neurological abnormalities and the most were identified as joint diseases. Among the joint diseases, it was noted that a patellar luxation was the most common, of which the grade 3 medial patellar luxation was the highest rated type of joint disease noted.

Key words : lameness, hindlimb, patellar luxation, small breed, dog.

Introduction

Lameness as it relates to animals is explained as an abnormal gait or posture caused by either a functional or structural disorder (12). In most cases, lameness is a sign of illness, not to be considered as a specific disease. In many ways, lameness may affect one or more limbs and can vary in severity from pain or tenderness to an inability to bear weight on limbs. Many causes of lameness including heritable and developmental defects, trauma, infection, and muscle contraction have been reported (3). The age, breed, sex, and weight of the animals also affect lameness (12). Additionally, the clinical symptoms of lameness can include pain, swelling, decreased range of motion, loss of muscle mass, abnormal posture and gait, and the incidence of a grating sound when walking. Diagnosis of the reason of lameness is made by a review of a blood analysis, X-rays, and computed tomography to determine muscular, skeletal, and neurological problems (12,18). In some cases, dogs due to their active nature often suffer from lameness (12). Generally speaking, the lameness of the hindlimb of a dog is commonly associated with the dog suffering a stifle joint and possibly having issues with the hip joint (7). Although lameness caused by musculoskeletal disorder is more common than neurological disorders, neurologic causes should always be taken into consideration in the diagnostic criteria to determine animal lameness (9,15,18). It is noted that some causes of lameness frequently affect fast-growing large breed dogs, while others

affect small breed dogs more (11). Although many reports have investigated lameness of middle and large breed dogs, few have investigated the factors related to the incidence of lameness of small breed dogs. As the population of small breed dogs is larger than that of large breed dogs in Korea, the aim of this study is to analyze the causes of hindlimb lameness in small breed dogs.

Materials and Methods

The medical records from small and toy breed dogs with the hindlimb lameness for one year were retrospectively reviewed. In this respect, the dogs registered for hindlimb lameness in the Veterinary Teaching Hospital of Chungbuk National University and Bupyeong SKY Animal Medical Center were taken into the study. A total of 413 dogs of ten representative breeds (Maltese, Pomeranian, Poodle, Yorkshire Terrier, Chihuahua, Shih Tzu, Pekingese, Spitz, Pom-pitz, and Miniature Pinscher) were used. The diagnosis was based on the history, clinical signs, physical examination, radiographic evaluation, and magnetic resonance imaging (MRI). If the neurological diseases were suspected during examination, an MRI was used to confirm the disease. The patients were classified according to diseases and the numbers and proportions were evaluated and recorded. Among the diseases, patellar luxation (PL) was divided into medial patellar luxation (MPL), bilateral MPL, and lateral patellar luxation (LPL) and the rate of bilateral MPL per PL was evaluated. Incidentally, the grade of MPL was classified into four stages using a previously reported system by Singleton (16) and the overall distribution of the grade according to the breeds was analyzed.

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Results

A total number of 413 dogs were analyzed in the study. The incidence of hindlimb lameness revealed the highest in Maltese (n = 158) followed by Pomeranians (n = 77), Poodle (n = 70), Yorkshire Terrier (n = 33), Chihuahua (n = 30), Shih Tzu (n = 22), Pekingese (n = 8), Spitz (n = 7), Pompitz (n = 6), and Miniature Pinscher (n = 2) (Table 1). There were 54%

Table 1. Classification by breeds with lameness of hindlimb

Breeds	Dogs
Maltese	158
Pomeranian	77
Poodle	70
Yorkshire Terrier	33
Chihuahua	30
Shih Tzu	22
Pekingese	8
Spitz	7
Pompitz	6
Miniature Pinscher	2
Total	413

(n = 223) of males and 46% (n = 190) of females. The mean age and body weight were 70 months and 4.05 kg, respectively. The degree of lameness noted was seen to have var-

Table 2. Representative diseases in patients with lameness of hindlimb

Problem	Dogs	%
Bilateral MPL	249	48.26
Unilateral MPL	48	9.30
IVDD	47	9.11
DJD	45	8.72
CCLR	45	8.72
Fracture	30	5.81
Neurologic disease	21	4.07
Hip dysplasia	18	3.49
LPL	7	1.36
LCPD	6	1.16
Total	516	100.00

MPL, medial patellar luxation; IVDD, intervertebral disc disease; DJD, degenerative joint disease; CCLR, cranial cruciate ligament rupture; LPL, lateral patellar luxation; LCPD, Legg-Calvé-Perthes disease.

Table 3. The number of patellar luxation and bilateral medial patellar luxation

Breeds	N	PL (N)	Bi-MPL (N)	Bi-MPL (%)
Maltese	158	115	92	80.00
Pomeranian	77	61	53	86.89
Poodle	70	50	39	78.00
Yorkshire Terrier	33	24	22	91.67
Chihuahua	30	25	22	88.00
Shih Tzu	22	12	10	83.33
Pekingese	8	4	2	50.00
Spitz	7	6	4	66.67
Pompitz	6	5	4	80.00
Miniature Pinscher	2	2	1	50.00
Total	413	304	249	

PL, patellar luxation; Bi-MPL, bilateral-medial patellar luxation.

Bi-MPL (%) = Bi-MPL(N)/PL(N)*100.

Table 4. Classification of patients with medial patellar luxation

Breeds	Grade I	Grade II	Grade III	Grade IV	Total
Maltese	11	57	136	3	207
Pomeranian	10	33	65	6	114
Poodle	30	21	35	3	89
Yorkshire Terrier	2	9	24	11	46
Chihuahua	4	7	31	5	47
Shih Tzu	6	5	9	2	22
Pekingese	1	2	3	0	6
Spitz	3	0	7	0	10
Pompitz	7	0	2	0	9
Miniature Pinscher	0	0	2	1	3
Total (N)	74	134	314	31	553
Total (%)	13.38	24.23	56.78	5.61	100.00

Table 5. Neurologic diseases causing lameness of hindlimb

Neurologic diseases	Classification	Dogs
IVDD (TL-spine)	Protrusion	24
	Extrusion	18
	EP	5
AAI		10
FCE		4
ANNPE		3
Myelitis		1
Spinal luxation		1
Arachnoid cyst		1
Myelomalacia		1
Total		68

IVDD, intervertebral disc disease; TL-spine, thoracolumbar-spine; EP, extrusion and protrusion; AAI, atlantoaxial instability; FCE, fibrocartilaginous embolism; ANNPE, acute non-compressive nucleus pulposus extrusion.

ied from an abnormal posture, non-weight bearing, walking wobbly to ataxia. In this study, a total of 16 diseases causing hindlimb lameness were analyzed from 765 limbs. The most common disease that was noted in this study was bilateral MPL (n = 249) followed by unilateral MPL (n = 48), intervertebral disc disease (IVDD) (n = 47), degenerative joint disease (n = 45), cranial cruciate ligament rupture (CCLR) (n = 45), fracture (n = 30), neurological diseases excluding IVDD (n = 21), hip dysplasia (HD) (n = 18), LPL (n = 7), and Legg-Calvé-Perthes Disease (n = 6) (Table 2). The patellar luxation (bilateral MPL, unilateral MPL, and LPL) was noted as the most frequent cause of hindlimb lameness, regardless of breeds. Among them, the bilateral MPL accounted for the highest proportion (249 out of 304) (Table 3). According to the grade of MPL, the incidence of grade 3 MPL was the highest (56.78%) followed by grade 2 MPL (24.23%), grade 1 MPL (13.38%), and grade 4 MPL (5.61%) (Table 4). In this study, the ratio of neurological diseases was 13.17% (n = 68) and IVDD composed of protrusion (n = 24), extrusion (n = 18), and extrusion and protrusion (n = 5) accounted the highest proportion of 9.11%. It was shown that other neurological diseases included atlantoaxial instability (n = 10), fibrocartilaginous embolism (n = 4), acute non-compressive nucleus pulposus extrusion (n = 3), myelitis (n = 1), spinal luxation (n = 1), arachnoid cyst (n = 1), and myelomalacia (n = 1) (Table 5).

Discussion

Previous reports have revealed a high occurrence of patellar luxation in small and toy breed dogs including: Poodle, Pomeranian, Yorkshire Terrier, Chihuahua, and Maltese (8, 14). It is noted that the Maltese, Pomeranian, Poodle, Yorkshire Terrier, and Chihuahua had a higher prevalence than other five breeds in this study. Among them, the Maltese showed the highest rate in this case. This result is thought to be due to the large number of Maltese dogs available in Korea. In other words, neurological diseases and orthopedic diseases such as IVDD, HD, and CCLR can cause lameness,

weakness, and/or incoordination (10,18). In this study, PL accounts for 59% (304 out of 516) of all diseases, similar to 61% of the previous study (17). Likewise, the rate of 72% (297 out of 413) in examined patients had MPL which was compared to the previous reports of 89% (13) and 92% (2), respectively. Here, LPL was found to be uncommon in small breed dogs and only 7 cases of LPL were confirmed in this study. Grade 3 (56.78%) and grade 2 (24.23%) patellar luxation showed a higher prevalence when reviewed, which is an agreement with the finding of other studies (1,6). One study described that grade 3 and grade 4 patellar luxation were the most frequently diagnosed with this condition (13). Most small breed dogs with grade 1 MPL were asymptomatic, while dogs with grade 3 MPL typically showed the clinical signs of lameness and disability. In addition to considering orthopedic diseases, the animal's neurologic diseases should also be taken into account to determine if there are any connections to lameness in the animal (9). It is known that diseases affecting caudal lumbar spinal nerve, the lumbosacral plexus, or peripheral nerves may cause hindlimb lameness. The most common diseases identified were degenerative disk disease, neoplasia, and discospondylitis (10). In general, IVDD commonly occurs within the thoracolumbar region and the incidence of thoracolumbar IVDD has been shown to be 83.6% and 86.1%, respectively (4,5). In this study, IVDD was identified as 69.1% (47 out of 68) of all the applicable neurological diseases identified for causing hindlimb lameness. The results of this study suggest that the lameness of the hindlimb in animals can appear for various reasons as is seen in domestic small and toy breed dogs. It is noted that the most common cause of hindlimb lameness was joint disease, with grade 3 MPL being the highest rate as identified in this study. As the breed distribution, major causes of hindlimb lameness, and the living environment of Korea are different compared to other countries, further study about the pattern of occurrence and the relationship between diseases is needed to make suitable clinical plans for the domestic small and toy breed dogs.

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