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Author(s)	Yasukawa, Shinji; Edamura, Kazuya; Tanegashima, Koji et al.
Citation	Japanese Journal of Veterinary Research, 64(1), 39-49
Issue Date	2016-02
DOI	https://doi.org/10.14943/jjvr.64.1.39
Doc URL	https://hdl.handle.net/2115/61034
Type	departmental bulletin paper
File Information	04_Yasukawa_Full.pdf



Epidemiologic study of dogs with the displacement or deformity of the medial and lateral fabellae in Japan

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Received for publication, August 20, 2015; accepted, February 1, 2016

Abstract

The prevalences of displacement and deformity of the medial and lateral fabellae in dogs were investigated. This was a retrospective epidemiologic study. Radiographs of canine stifle joints (1022 limbs, 534 dogs) were obtained. The images were taken at the Nihon University Animal Medical Center and three private animal hospitals from January 2003 to July 2012. The position and morphology of the medial or lateral fabella were evaluated on the radiographs. The prevalence of displacement of the medial and lateral fabellae was 1.7% and 0.3%, respectively. The prevalence of deformity of the medial and lateral fabellae was 6.9% and 4.6%, respectively. Aplasia or hypoplasia of the fabella was detected more frequently in the medial fabella. On the other hand, a bipartite or multipartite fabella was observed more frequently in the lateral fabella. Nearly all cases of displacement or deformity of the fabella occurred in dogs weighing less than 10 kg. Abnormalities of the fabella were observed in the medial and lateral fabella. We found that abnormal fabellae were closely associated with medial patellar luxation and to a lesser extent with cranial cruciate ligament rupture. No clinical signs were associated with an abnormality of the fabella, with the exception of two dogs with traumatic avulsion of the lateral head of the gastrocnemius muscle.

Key Words: Deformity, Displacement, Dog, Fabella

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doi: 10.14943/jjvr.64.1.39

Introduction

The medial fabella and lateral fabella are located at the caudal aspect of the femoral condyles in dogs⁵⁾. Each fabella is in the tendon of origin of the corresponding head of the medial or lateral gastrocnemius muscle^{5,15)}. The medial fabella is smaller than the lateral fabella and is angular⁵⁾; it often is slightly more distal than the lateral fabella¹⁵⁾. The lateral fabella is globular, except for a truncated end, which faces distally and has a nearly flat articular surface for the facet on the caudal part of the lateral femoral condyle⁵⁾.

The displacement or deformity of the fabella occasionally occurs in dogs without any perceived clinical significance^{2,15)}. These often occur bilaterally, possibly because of a congenital abnormality¹⁵⁾. Traumatic avulsion of the proximal tendon of the gastrocnemius muscle causes displacement of the fabella^{1,6,7,10,12,14,17,18)}. Nearly all dogs with displacement or deformity of the fabella are clinically asymptomatic and these conditions are often detected incidentally with the diagnosis of other diseases²⁾. To the best of our knowledge, there is only one epidemiologic study on the displacement or deformity of the medial fabella in dogs¹⁵⁾. Störk *et al.*¹⁵⁾ reported that a medial fabella in an abnormal location is more common in the West Highland White Terrier than in other breeds, and occurs only in small-breed dogs.

There have been no large-scale epidemiologic studies on the prevalence of displacement or deformity of the lateral fabella. In canine clinical practice, displacement or deformity of the lateral fabella is occasionally observed on stifle radiographs. An abnormality of the lateral fabella may affect the treatment strategy of cranial cruciate ligament rupture (CrCLR) because the lateral fabella is an important landmark for the lateral suture stabilization technique. These abnormalities can occur in the medial and lateral fabellae. It is therefore desirable to investigate simultaneously the medial and lateral fabellae.

The main purpose of this study is to investigate the prevalence of displacement or deformity of the medial and lateral fabellae simultaneously, to compare the results of the medial fabella with the previous study, to reveal the differences between medial and lateral fabellae, and to assess the relationship between the abnormalities of the fabella and major concurrent orthopedic disease in the stifle joint.

Materials and Methods

Case selection: Radiographs were reviewed that were taken from January 2003 to July 2012 at Nihon University Animal Medical Center and at three private animal hospitals (Kawabata Animal Hospital, Tsujido Cats and Dogs Clinic, and Mare Animal Clinic). The directors of these hospitals approved this study.

Dogs were positioned in dorsal recumbency with the hip joints extended and the femurs parallel to the radiographic table. We selected all radiographs that fulfilled the following conditions: patella in the center of the trochlear sulcus, bisection of each fabella by the respective femoral cortex, and protrusion of the corticocancellous tip of the lesser trochanter from the medial aspect of the femur¹⁶⁾. If aplasia of the fabella or medial patellar luxation (MPL) was observed, we employed stifle radiographs that fulfilled all at least two of these three criteria to ensure true craniocaudal views. Clinical data from the medical records were retrospectively collected on breed, sex, neutering status, age, body weight at the time of radiographic examination. In addition, we investigated the clinical signs, concurrent orthopedic disease such as CrCLR or MPL, and symmetry of the fabella disorders. It is reported that normal ossification of the fabella occurs at 3 months in dogs⁴⁾. Therefore, we excluded dogs aged less than 3 months in the present study.

Evaluation of fabella displacement and deformity: The position of the medial fabella was evaluated

on the craniocaudal stifle radiographs on the basis of a modification of the method described by Störk *et al.*¹⁵⁾. On the craniocaudal stifle radiograph, a horizontal line was drawn at the level of the proximal aspect of the intercondylar fossa (Fig. 1). A perpendicular line, vertically oriented, was then drawn through the surface of the medial femoral condyle (Fig. 1). We recorded the location of the center of the medial fabella in the four compartments formed by these two lines (Fig. 1). The position of the medial fabella was 'normal' if the center of the medial fabella was in the proximolateral compartment (Fig. 1). The position of the medial fabella was otherwise considered 'abnormal'.

The position of the lateral fabella was evaluated using a modification of the method described previously for the medial fabella (Fig. 1). The position of the lateral fabella was 'normal' if the center of the lateral fabella was in the proximomedial compartment (Fig. 1). The position of the lateral fabella was otherwise 'abnormal'.

The morphologies of the medial and lateral fabellae were evaluated on the radiographs of the craniocaudal stifle and mediolateral stifle, using the modified method described by Störk *et al.*¹⁵⁾. In the present study, the deformity of the fabella was classified as 'normal', 'aplasia', 'hypoplasia', 'hyperplasia', 'bipartite', and 'multipartite'. 'Aplasia' was defined as no visible fabella in both the craniocaudal and mediolateral radiographs. If the size of the fabella was less than 50% compared to that of the opposite side or that of the same breed dog, we defined the fabella as showing 'hypoplasia'. Similarly, if the size of the fabella was more than twice that of the opposite side or that of the same breed dog, we defined the fabella as showing 'hyperplasia'. The size of fabella was evaluated by calculating the area of the fabella.

Statistical analysis: Statistical analyses were performed using GraphPad Prism (GraphPad Software Inc., San Diego, CA, USA). The Mann-Whitney *U* test was used to compare independent variables such as age. The chi-square test was

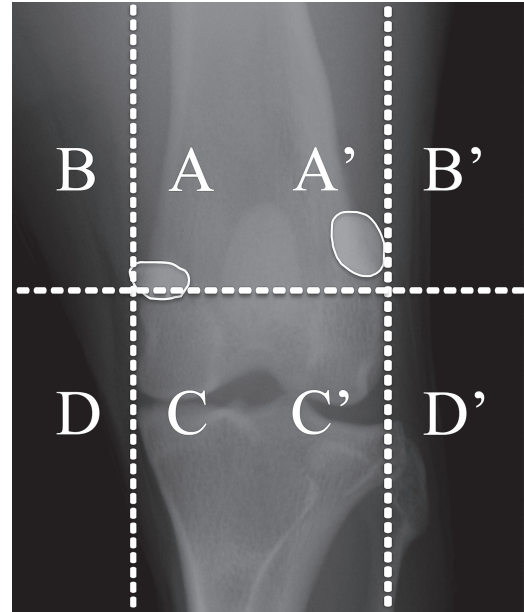


Fig. 1. Method to evaluate the fabella position on craniocaudal radiograph of the left stifle. A horizontal line is drawn at the level of the proximal aspect of the intercondylar fossa. Perpendicular lines, vertically oriented, are drawn through the surface of the medial and lateral femoral condyle. We recorded where the center of the medial fabella or lateral fabella was located in the four compartments formed by each of two lines. (A) Normal compartment, (B) proximomedial compartment, (C) distolateral compartment, and (D) distomedial compartment in the medial fabella. (A') Normal compartment, (B') proximolateral compartment, (C') distomedial compartment, and (D') distolateral compartment in the lateral fabella.

performed to compare categorical variables such as breed, sex, body weight, concomitant diseases, and the displacement or deformity of the fabella. In addition, Fisher's exact test was used to compare unilateral and bilateral prevalences of abnormalities. The odds ratio and 95% confidence interval were calculated for the risk of displacement or deformity of the fabella. Values of $P < 0.05$ indicated a statistically significant difference.

Results

Patient data

During the period of data collection, 1022 limbs of 534 dogs satisfied the inclusion criteria.

In some dogs, a unilateral stifle radiograph was evaluated. The breeds affected are shown in Table 1. The mean age of the dogs was 5.0 ± 4.1 years (range, 3 months –17 years; median, 4.0 years). The percentage of intact males, neutered males, intact females, and neutered females was 27.1% ($n = 145$), 23.4% ($n = 125$), 23.8% ($n = 127$), and 25.7% ($n = 137$), respectively. There was no significant difference between the sexes. The mean body weight of all evaluated dogs was 11.6 ± 10.5 kg (range, 1.1–61.9 kg; median, 7.2 kg).

Displacement of the medial fabella

Displacement of the medial fabella was detected in 1.7% (17/984) of evaluated limbs (Table 2). The medial fabella was displaced distolaterally in 0.6% (6/984) of evaluated limbs

(Fig. 2A), and distomedially in 1.1% (11/984) of evaluated limbs (Fig. 2B). No proximomedial displacement of the medial fabella was observed. The displacement of the medial fabella was observed unilaterally and bilaterally in 1.4% and 1.0% of affected limbs, respectively, and no significant difference was detected between unilateral and bilateral prevalences.

The prevalences of displacement of the medial fabella in breeds represented by more than six subjects in the study are shown in Table 3 and additionally West Highland White Terrier (2/3 dogs), Japanese Chin (1/1 dog), and Wire-haired Fox Terrier (1/1 dog) were affected. No clinical signs associated with displacement of the medial fabella were identified in the affected breeds. No significant difference was detected

Table 1. Evaluated breeds

	<i>n</i>		<i>n</i>
Toy Poodle	59	German Shepherd, Jack Russell Terrier,	5
Miniature Dachshund	54	Bernese Mountain Dog	
Chihuahua	43	Miniature Pinscher	4
Labrador Retriever	41	West Highland White Terrier, Flat-coated Retriever, French Bulldog	3
Golden Retriever	32	American Cocker Spaniel, Italian Greyhound,	2
Yorkshire Terrier	28	English Springer Spaniel, Siberian Husky,	
Border Collie	25	Spitz, Boston Terrier, Rottweiler	
Welsh Corgi	22	Irish Wolfhound, Irish Setter, Akita inu,	1
Pomeranian	21	American Beagle, Australian Silky Terrier,	
Shiba	18	Great Dane, Great Pyrenees, Samoyed, Scottish	
Papillon	15	Terrier, Standard Dachshund, Dalmatian,	
Beagle	13	Tibetan Terrier, Japanese Chin, Doberman	
Shetland Sheepdog	12	Pinscher, Neapolitan Mastiff, Newfoundland,	
Shih-tzu	11	Norfolk Terrier, Brussels Griffon, Bulldog,	
Maltese	9	Borzoi, Bolognese, Weimaraner, Wire-haired	
Miniature Schnauzer	8	Fox Terrier	
Cavalier King Charles Spaniel	7	Mixed breeds	35
English Cocker Spaniel, Pug	6	Unknown	6
		Total	534

n = the number of dogs.

Table 2. The prevalence of displacement and deformity of the fabella

	Medial fabella	Lateral fabella
Displacement	1.7% (17/984 limbs)	0.3% (3/1020 limbs)
Deformity	6.9% (71/1022 limbs)	4.6% (47/1022 limbs)

between the sexes. The mean age of dogs at the detection of displacement of the medial fabella was 6.0 ± 4.4 years (range, 3 months – 13 years old; median, 4.0 years). There was no significant correlation between the age at identification of the fabellar abnormality and displacement of the medial fabella. The body weight of all dogs with

a displacement of the medial fabella was less than 10 kg. Medial patellar luxation and CrCLR were diagnosed in 52.9% and 11.8%, respectively, of the limbs with displacement of the medial fabella. There was a significant correlation between MPL and distomedial displacement of the medial fabella ($P = 0.001$; odds ratio, 5.85); however, no significant correlation was detected between CrCLR and displacement of the medial fabella.

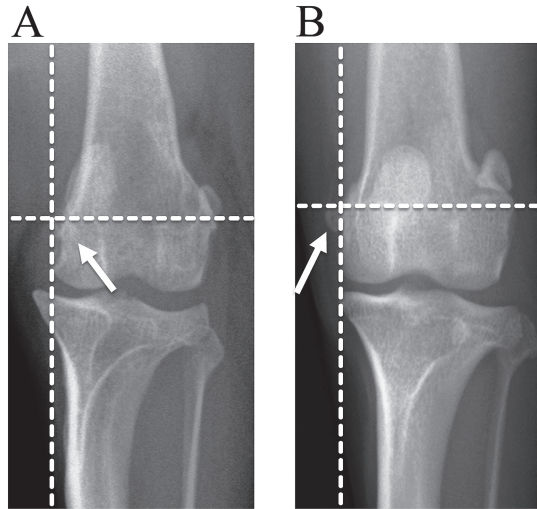


Fig. 2. Displacement of the medial fabella. (A) Distolateral displacement (craniocaudal view of the left stifle). (B) Distomedial displacement (craniocaudal view of the left stifle).

Deformity of the medial fabella

A deformity of the medial fabella was detected in 6.9% (71/1022) of the evaluated limbs (Table 2). The prevalence of deformity of the medial fabella was significantly greater than that of displacement of the medial fabella ($P < 0.0001$). The types of deformity of the medial fabella are shown in Table 4. Hyperplastic, bipartite, and multipartite fabellae were not detected (Fig. 3). A deformity of the medial fabella was observed unilaterally and bilaterally in 1.5% and in 5.8% of the study limbs, respectively, and a significant difference was detected between unilateral and bilateral prevalences ($P = 0.0002$).

The breeds showing deformity of the medial

Table 3. Affected breeds with the displacement of the medial fabella

	affected (<i>n</i>)	total (<i>n</i>)	rate	odds ratio	95% confidence intervals		
Yorkshire Terrier	2	28	7.1%	1.5	0.31	–	7.23
Chihuahua	2	43	4.7%	0.87	0.19	–	4.16
Maltese	1	9	11.1%	2.42	0.28	–	21.10
Miniature Dachshund	1	54	1.9%	0.29	0.04	–	2.29
Toy Poodle	1	59	1.7%	0.26	0.03	–	2.02
Mixed breeds	1	35	2.9%	0.5	0.06	–	4.00

n = the number of dogs, *: significant difference ($p < 0.05$)

Table 4. The prevalence with the deformity of the fabella

	Medial fabella	Lateral fabella
Normal	93.1% (951/1022 limbs)	95.4% (975/1022 limbs)
Aplasia	3.7% (38/1022 limbs)	0.2% (2/1022 limbs)
Hypoplasia	3.2% (33/1022 limbs)	1.3% (13/1022 limbs)
Hyperplasia	—	0.4% (4/1022 limbs)
Bipartite	—	1.0% (10/1022 limbs)
Multipartite	—	1.8% (18/1022 limbs)

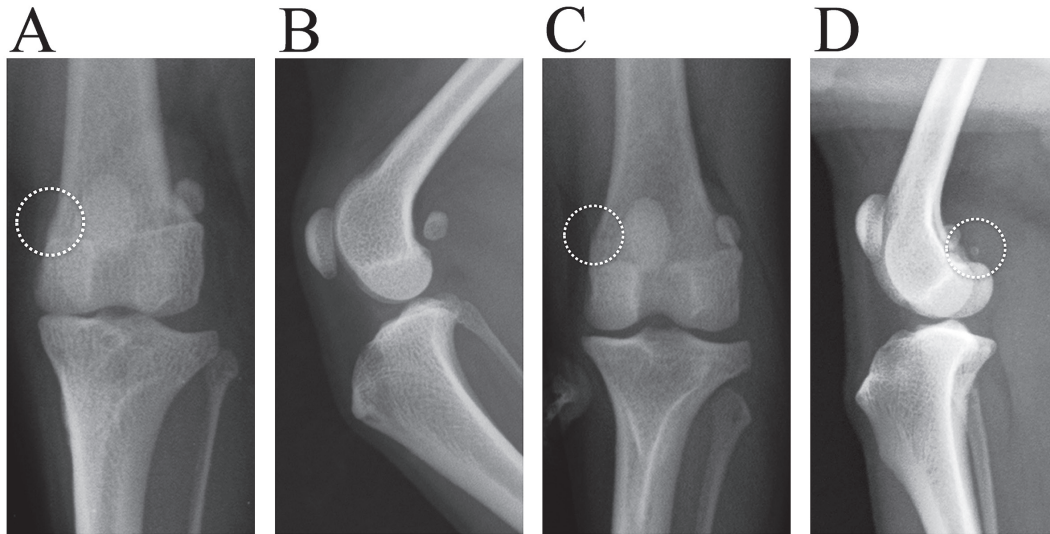


Fig. 3. Deformity of the medial fabella. (A) Aplasia (craniocaudal view of the left stifle). (B) Aplasia (mediolateral view of the left stifle). (C) Hypoplasia (craniocaudal view of the left stifle). (D) Hypoplasia (mediolateral view of the left stifle).

fabella are shown in Table 5 and additionally one bulldog was affected. No clinical signs associated with deformity of the medial fabella were identified in the affected breeds. No significant difference existed between the sexes. The mean age of dogs at detection of deformity of the medial fabella was 4.8 ± 4.4 years (range, 3 months – 13 years; median, 4.0 years). There was no significant correlation between the age at identification and deformity of the medial fabella. The prevalence of deformity of the medial fabella in dogs weighing less than 10 kg, 10–20 kg, and more than 20 kg was 13.3%, 1.1%, and 0%, respectively. The prevalence of deformity of the medial fabella in dogs weighing less than 10 kg was significantly higher than the prevalence in dogs weighing 10–20 kg ($P = 0.041$) or more than 20 kg ($P = 0.0443$). Medial patellar luxation was observed in 43.7% of the limbs with a deformity of the medial fabella, whereas CrCLR was diagnosed in only one limb with a deformity of the medial fabella. There was a significant correlation between MPL and a deformity of the medial fabella ($P < 0.0001$; odds ratio, 3.61).

Displacement of the lateral fabella

Displacement of the lateral fabella was

present in 0.3% (3/1020) of evaluated limbs (Table 2). The prevalence of displacement was significantly lower in the lateral fabella than the medial fabella ($P = 0.001$). Displacement of the lateral fabella only occurred unilaterally.

The affected breeds were the Shetland Sheepdog (2/12 dogs; odds ratio, 5.40) and Yorkshire Terrier (1/28 dogs; odds ratio, 0.19). No clinical signs were identified in a Yorkshire Terrier with proximolateral displacement of the lateral fabella. By contrast, two Shetland Sheepdogs with distolateral displacement of the lateral fabella presented with a plantigrade stance and a traumatic avulsion of the lateral head of the gastrocnemius muscle (Fig. 4A–4D). Severe lameness was identified in only these two dogs, although no clinical signs were observed in other fabella displacement or deformity types.

Deformity of the lateral fabella

Deformity of the lateral fabella was found in 4.6% (47/1022) of evaluated limbs (Table 2). The prevalence of deformity was significantly less in the lateral fabella than in the medial fabella ($P = 0.023$). The prevalences of aplasia, hypoplasia (Fig. 5A), hyperplasia (Fig. 5B), bipartite fabella (Fig. 5C and 5D), and multipartite fabella (Fig. 5E)

Table 5. Affected breeds with the deformity of the medial fabella

	affected (n)	total (n)	rate	odds ratio	95% confidence intervals		
Miniature Dachshund	9	54	16.7%	1.72	0.77	–	3.86
Toy Poodle	7	59	11.9%	0.88	0.37	–	2.09
Yorkshire Terrier	5	28	17.9%	1.52	0.54	–	4.24
Chihuahua	5	43	11.6%	0.86	0.32	–	2.34
Papillon	3	15	20.0%	1.72	0.46	–	6.40
Pomeranian	3	21	14.3%	1.12	0.31	–	3.99
Maltese	2	9	22.2%	1.96	0.39	–	9.76
Pug	1	6	16.7%	1.34	0.15	–	11.81
Cavalier King Charles Spaniel	1	7	14.3%	1.12	0.13	–	9.52
Shih-tzu	1	11	9.1%	0.66	0.08	–	5.29
Shiba	1	18	5.6%	0.38	0.05	–	2.92
Mixed breeds	1	35	2.9%	0.18	0.02	–	1.32

n = the number of dogs, *: significant difference ($p < 0.05$)

in the lateral fabella are shown in Table 4. In the present study, hyperplastic, bipartite, and multipartite fabellae were observed in only the lateral fabella. Deformity of the lateral fabella was observed unilaterally and bilaterally in 3.6% and 2.6% of affected limbs, respectively, and no significant difference was detected between unilaterally and bilaterally affected limbs.

The breeds showing deformity of the lateral fabella are listed in Table 6 and additionally Flat-coated Retriever (1/3 dogs) and Jack Russell Terrier (1/5 dogs) were affected. Hyperplasia of the lateral fabella was identified only in the Border Collie breed. No clinical signs associated with deformity of the lateral fabella were identified in the affected breeds. No significant difference was observed between the sexes. The mean age of dogs with a deformity of the lateral fabella at detection was 5.7 ± 4.1 years (range, 3 months – 13 years; median, 5.0 years). The prevalence of deformity of the lateral fabella in dogs weighing less than 10 kg, 10–20 kg, and more than 20 kg was 9.2% (27/294 dogs), 4.3% (4/94 dogs), and 1.1% (1/91 dogs), respectively. The prevalence of a deformity of the lateral fabella was significantly greater in dogs weighing less than 10 kg than in dogs weighing more than 20 kg ($P = 0.0095$).

Medial patellar luxation and CrCLR were

detected in 40.4% and 12.8%, respectively, of the limbs with a deformity of the lateral fabella. There was a significant correlation between deformity of the lateral fabella and MPL ($P < 0.0001$; odds ratio, 3.97) and CrCLR ($P = 0.001$; odds ratio, 4.05). The affected dogs had no clinical signs associated with deformity of the lateral fabella.

Discussion

The prevalence of displacement or deformity of the medial fabella was 1.7% or 6.9%, respectively. The body weight of nearly all dogs with an abnormality of the medial fabella was less than 10 kg. Störk *et al.*¹⁵⁾ reported their results of an epidemiological study on the abnormal location of the medial fabella. Their study demonstrated that the breed most affected by displacement of the medial fabella was the West Highland White Terrier (61.4%); displacement of the medial fabella was detected only in dogs weighing less than 18 kg. In the present study, the prevalence of displacement of the medial fabella in the West Highland White Terrier (66.7%) was similar to that previously reported by Störk *et al.*¹⁵⁾. In addition, displacement of the medial fabella was not observed in dogs weighing more than 10 kg. Störk *et al.*¹⁵⁾ also reported that the prevalence of

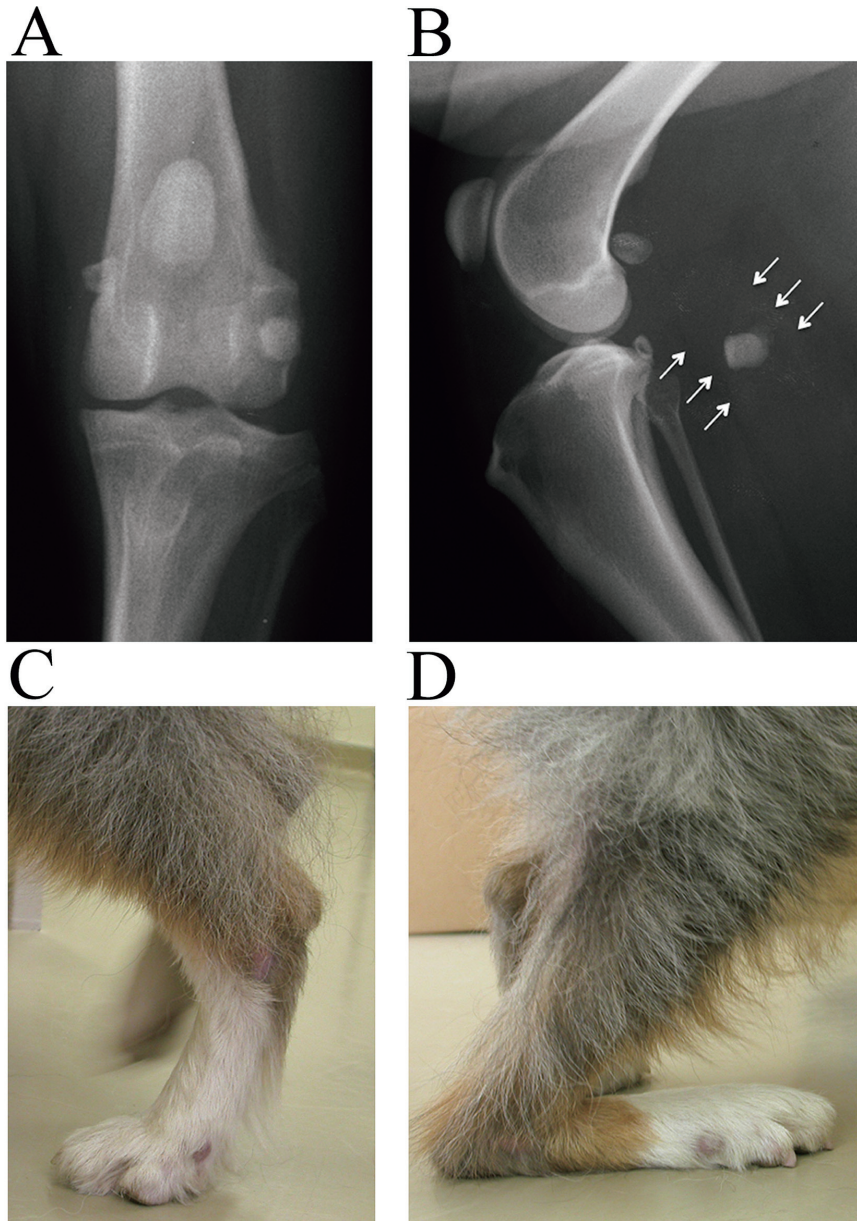


Fig. 4. (A) Craniocaudal radiograph and (B) mediolateral radiograph of traumatic avulsion of the lateral head of the gastrocnemius muscle. The lateral fabella and the lateral head of the gastrocnemius muscle are markedly displaced distocaudally (white arrow). (C) The left limb is normal. (D) The affected limb presents with a plantigrade stance.

deformity of the medial fabella was lower than that of displacement and that deformity of the medial fabella was detected only in dogs weighing less than 18 kg. In the present study, the body weight of most dogs with a deformity of the medial fabella was less than 10 kg. No sex predilection was observed, and this result was similar to that reported by Störk *et al.*¹⁵⁾.

To the best of our knowledge, there have been no large-scale epidemiologic studies on the prevalence of the displacement or deformity of the lateral fabella. This study revealed that the prevalences of displacement and deformity were significantly lower in the lateral fabella than in the medial fabella. In the present study, those differences between medial and lateral fabella

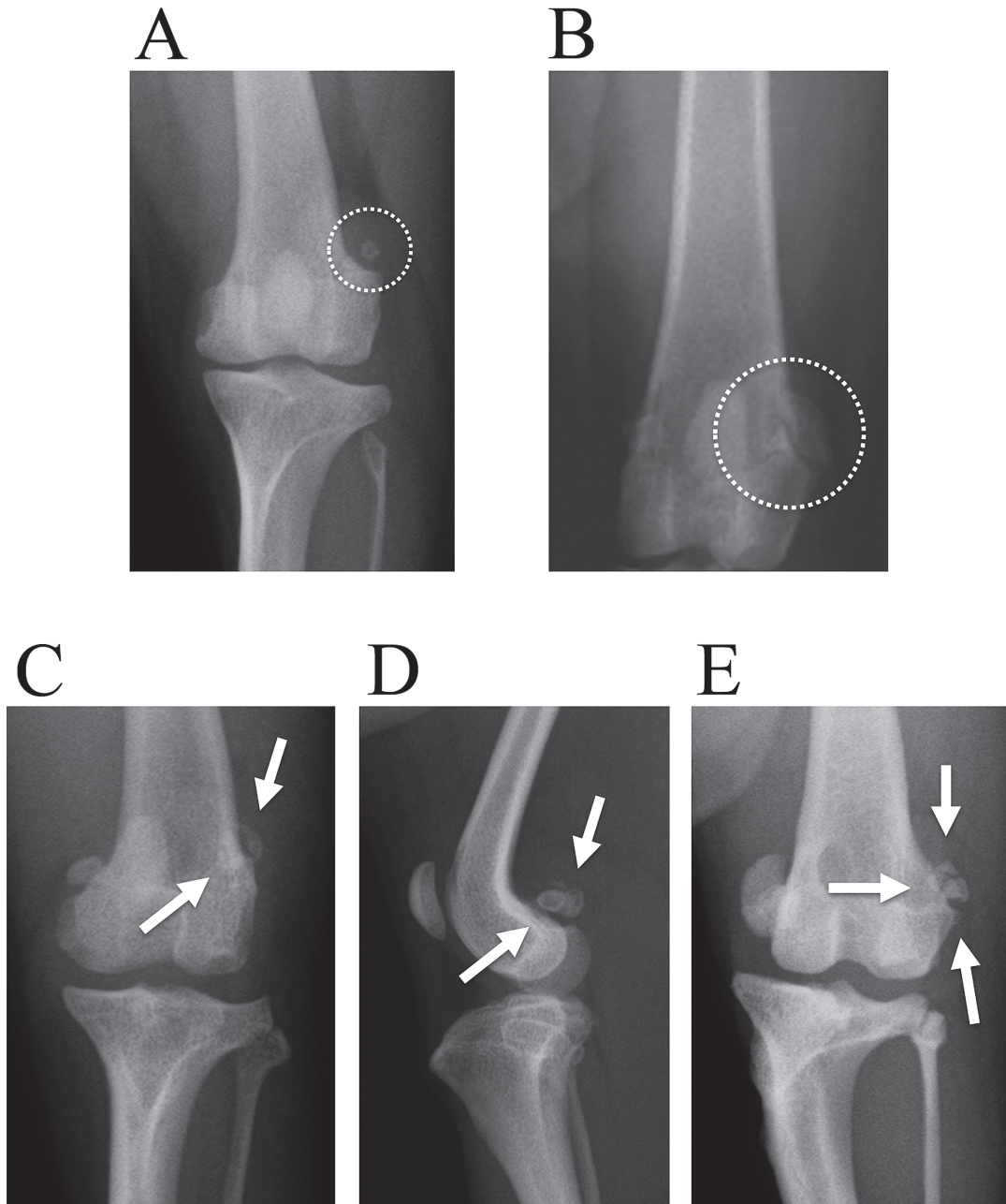


Fig. 5. Deformity of the lateral fabella. (A) Hypoplasia (craniocaudal view of the left stifle). (B) Hyperplasia (craniocaudal view of the left stifle). (C) Bipartite fabella (craniocaudal view of the left stifle). (D) Bipartite fabella (mediolateral view of the left stifle). (E) Multipartite fabella (craniocaudal view of the left stifle).

abnormalities could not be clarified. No clinical signs associated with the displacement of the lateral fabella were identified, with the exception of two dogs that were diagnosed with traumatic avulsion of the lateral head of the gastrocnemius muscle.

Bipartite and multipartite fabellae were

identified in the lateral fabella, although these deformities were not observed in the medial fabella (Table 4). Radiographically, fracture must be differentiated from developmental conditions such as bipartite and multipartite fabellae⁸⁾. Houlton and Ness reported that recent fracture of the fabella was associated with clinical signs

Table 6. Affected breeds with the deformity of the lateral fabella

	affected (n)	total (n)	rate	odds ratio	95% confidence intervals		
Yorkshire Terrier	6	28	21.4%	1.98	0.74	–	5.32
Toy Poodle	6	59	10.2%	0.69	0.27	–	1.77
Pomeranian	5	21	23.8%	2.25	0.77	–	6.64
Pug	3	6	50.0%	7.17	1.38	–	37.16 *
Border Collie	3	25	12.0%	0.89	0.25	–	3.16
Papillon	2	15	13.3%	1.02	0.22	–	4.73
Cavalier King Charles Spaniel	1	7	14.3%	1.10	0.13	–	9.48
Maltese	1	9	11.1%	0.82	0.10	–	6.78
Shih-tzu	1	11	9.1%	0.65	0.08	–	5.25
Shiba	1	18	5.6%	0.37	0.05	–	2.87
Chihuahua	1	43	2.3%	0.13	0.02	–	0.99 #

n = the number of dogs, *: significantly high ($p < 0.05$), #: significantly low ($p < 0.05$)

and indicated fragmentation of the fabella with small pieces of bone having sharply defined borders. In contrast, developmental conditions demonstrated similar-sized portions with regular borders and unchanging shape^{3,13}). In the present study, bipartite and multipartite fabellae were associated with no clinical signs and showed a rounded shape on radiographic images; therefore, we considered these fabellae as developmental conditions.

As far as we know, there have been no reports on hyperplasia of the fabella. In the present study, only the Border Collie breed exhibited hyperplasia of the lateral fabella. Houlton and Ness reported that fractures of the fabella gradually filled with mineralized callus as they healed³). Border Collies that were identified with bigger fabellae had no history of trauma and did not present clinical signs associated with the fabellar abnormality. In addition, we observed no radiographic findings as described above. Therefore, we evaluated this abnormality as ‘hyperplasia’. This study revealed that nearly all dogs with a deformity of the lateral fabella weighed less than 10 kg. This result was significant and was the same as that in displacement as well as deformity of the medial fabella.

Störk *et al.*¹⁵) reported that there was no significant correlation between abnormal location of the medial fabella and concomitant orthopedic

diseases. However, in the present study, there was a significant correlation between MPL and displacement or deformity of the medial fabella. In addition, there was a significant correlation between deformity of the lateral fabella and MPL. All displacements of the medial fabella in this study were incidental findings, and this result was consistent with that described by Rendano and Dueland¹¹). Most canine MPLs are regarded as congenital or developmental, because they occur early in life without trauma⁹). From these backgrounds, the abnormalities of the patella and fabella that form part of the stifle joint may derive from multiple developmental abnormalities. In addition, the development of the fabellae that are formed within the tendon of gastrocnemius muscle may be affected by abnormal biomechanical force associated with MPL.

There was also a significant correlation between deformity of the lateral fabella and CrCLR. We regard the relationship as incidental finding, because the cause of canine CrCLR is considered to be age-related decline in material properties of the cranial cruciate ligament⁹). This result suggests that it is necessary to investigate the presence and form of the lateral fabella on the survey stifle radiograph before surgery in small dogs with CrCLR.

In the present study, the radiographs of nearly half of the dogs were taken due to diagnose

non-orthopedic disease. However, the remaining half of the dogs were the cases with hind limb lameness. The limitations of this study were that only dogs that were presented to the hospital were investigated, and that the suspected cases of the hind limb orthopedic disease occupied the half of this population. Further study will be needed in order to examine the more accurate prevalence of the abnormalities of the fabella.

In conclusion, abnormalities of the fabella were observed in the medial fabella and lateral fabella. The prevalences of displacement and deformity were significantly lower in the lateral fabella than in the medial fabella. We found that abnormal fabellae were closely associated with MPL and to a lesser extent with CrCLR. Nearly all dogs with fabellar abnormalities weighed less than 10 kg. No clinical signs associated with displacement or deformity of the fabellae were identified, with the exception of dogs with traumatic avulsion of the lateral head of the gastrocnemius muscle.

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