

CANINE ELBOW DYSPLASIA IN DIFFERENT BREEDS

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Abstract

The analysis of elbow radiographs of 21 272 dogs, examined during 1988-2005, enabled us to estimate the frequency of canine elbow dysplasia in 90 breeds of dogs. Relation between breeds and incidence of elbow dysplasia was established statistically. The percentage of affected specimens was surprisingly low at 0.7% (150 dogs), and distinctly lower than the percentages reported by several authors in Germany, the USA, and other countries. The highest number of dogs affected was found in 47 (1.7% of total number studied) German Shepherds, in 25 Rottweilers (2%), and in 17 Dachshunds (0.5%). Breeds most often affected were of FCI group II, namely English Mastiffs (9%), Dogue de Bordeaux (8.5%), Neapolitan Mastiffs (8.3%), and Newfoundlands (4.6%). Elbow dysplasia was also found with significant frequency in breeds of the FCI group VIII – Labrador Retrievers (4.3%) and Golden Retrievers (4.4%). Fragmented coronoid process (FCP) was most frequently diagnosed (58.0% out of 150 affected specimens). Ununited anconeal process (UAP), was diagnosed in 32.0%. FCP and UAP together were present in 6.7% of the dysplastic specimens. No cases of osteochondritis dessecans and joint incongruity were found. UAP cases were most common in German Shepherds, while FCP occurred most frequently in Dogues de Bordeaux and Rottweilers.

Key words: dog, elbow dysplasia, breed predisposition.

The term "canine elbow dysplasia" was used for the first time in 1961 to describe a certain anomaly of the elbow joint (4). This condition results from cartilage incongruities as well as from various anomalies in bone development (3). The latter include ununited anconeal process (UAP), fragmented coronoid process (FCP), osteochondrosis, or osteochondritis dissecans (OCD) of the medial aspects of the humeral condyle and joint incongruity (JI) of the elbow joint (12, 13). By the International Elbow Working Group, elbow arthrosis (EA) caused by FCP, UAP, OCD, and JI is the manifestation of an inherited elbow dysplasia

Each of those anomalies can exist separately, but usually two or even three of them are found co-existing in one dog.

Some authors claim this condition to be congenital and hereditary, of polygenic inheritance (14). British studies in Labrador and Golden Retrievers established relatively high heritabilities for osteochondrosis dissecans (OCD) and fragmented coronoid process (FCP). Both conditions were found to be inherited separately (8).

Several papers (8, 20) attribute elbow dysplasia mainly to large dogs (weighing over 20 kg) and sporting breeds. Other authors, e.g. Wind and Packard (18), having compared relative lengths of the ulna and radius in 825 medium-sized and large dogs, concluded the condition was breed related, especially in large and heavy dogs. It is generally agreed that the main reason for elbow joint malformation is a rapid increase in body mass, associated with simultaneous onset of bone and cartilage necrosis, leading to malformation of medial coronoid process, as well as medial humeral condyle and anconeal process, both conditions being related.

Alternatively, the primary cause of elbow dysplasia might be an injury to articular and/or growth cartilage (3, 13). Injuries are likely to happen due to excessive training of young dogs; therefore, elbow dysplasia can be often found in working and sporting dogs (8).

In many countries, their respected breeding councils consider elbow dysplasia in several breeds as severe problems as requiring radiological testing before a dog is qualified for breeding. No similar requirements have been introduced in Poland yet, and there have been no data describing this problem in Polish dog population.

The aim of this study was to describe the incidence of ED in 90 breeds classified according to the Federation Cynologique Internationale (FCI) system into 10 groups, admitted for RTG of front limbs in 1988-2005 to our Clinic.

Material and Methods

This study was based on results of radiographical examination performed in 21 272 dogs of different breeds from 1988 to 2005. The dogs were examined for different reasons – some of them were X-

rayed due to lameness and/or foreleg pain, whereas other results came from screening. During X-ray examination, all the dogs were either anaesthetised or sedated. Both elbows were radiographed in mediolateral (flexed and extended) and craniocaudal oblique projections. X-ray imaging of elbows were classified as normal or abnormal, without gradation of arthrosis.

Ninety breeds were represented and classified in accordance to FCI system into 10 groups. Nine coat and size varieties of dachshunds (FCI Group IV) were not separately classified due to incomplete data. Groups VII and X were also classified jointly. In several groups, some rare breeds were classified jointly as "Other".

The results presented are limited only to diagnosed cases of elbow dysplasia. The percentage of dysplastic dogs was calculated in each breed (Table 1), considering the percentage of all forms of ED. The relation between breed and presence of elbow dysplasia was established with the chi-square test; in the case of expected numbers in sub-groups lower than minimal, we used a detailed Fisher test.

Results and Discussion

The results of this study, which is, to the authors' knowledge, the first analysis of the incidence of primary lesions of elbow dysplasia in Polish population of purebred dogs and random bred dogs are presented in Table 1. The study shows that among 21 272 dogs elbow dysplasia was found in 0.7% of them (N=150), and was most often found in breeds represented in the biggest numbers, i.e. 47 German Shepherds (1.7% of total number studied), 25 Rottweilers (2%), and 17 Dachshunds (0.5%).

The highest percentages of dysplastic dogs were found in group II - Pinschers and Schnauzers, Molossians and Swiss Mountain - and Cattle Dogs, and in group VIII - Retriever, Flushing and Water Dogs. In each of these groups, chi-square test was calculated for each breed with at least one confirmed case of elbow dysplasia. However, it was impossible to establish any significant influence of the breed on the incidence of elbow dysplasia, most probably due to low numbers of dogs in each group. It is worth mentioning, though, that the highest percentages of dysplastic dogs were found in breeds from Section 2 of group II, namely Molossians (7.9%) and breeds from Molossians - Mountain Type (2.1%). In this group, the following breeds were found to show the highest incidences of elbow dysplasia: Mastiff - 9.1% (N=2), Dogue de Bordeaux - 8.5% (N=8), Neapolitan Mastiff - 8.3% (N=8), and Newfoundland - 4.6% (N=5). The results are to be interpreted with some caution due to relatively small numbers of dogs studied. None of these breeds is particularly numerous in Poland. In group VIII, elbow dysplasia was relatively common in Golden Retrievers - 4.4% (N=3) and Labrador Retrievers - 4.3% (N=4), while no case was found in Cocker Spaniels.

The analysis of over 20 000 radiograms of different breeds of dogs, taken during 13 years, resulted in estimated incidence of canine elbow dysplasia (ED) at

0.7%, which is significantly lower than reported previously by other authors. Although elbow dysplasia was mainly found in large breeds of dogs and was consistent with results published by other authors; its incidence never exceeded 10% and it was dramatically lower than reported in some breeds in other countries. Studies by some authors (1, 2) reported much higher incidences in Rottweilers (46%), Bernese Mountain Dogs and St. Bernards (34%), and German Shepherds (20%). It is worth to note that results obtained by different authors for different breeds and in different countries are extremely variable. In France (15), the prevalence of elbow dysplasia was found in 19.4% of German Shepherds, while Grondalen (7) reported the prevalence between 15 and 20 % in German Shepherds in Sweden. However, the results reported by Tellhelm *et al.* (17) showed the prevalence between 30% and 50% in German Shepherd in Germany. Morgan *et al.* (11) in their study on American Labrador Retrievers found ED in 17.8%. Interesting results were presented by Wind and Packarda (19), who compared two groups of Labrador guide dogs and others and concluded that there were large differences in the prevalence of joint disease in these subpopulations. Those striking differences may be attributed to different study groups. It may be presumed that the French and Swedish data were obtained in dogs admitted to radiography after having been preliminarily diagnosed of elbow dysplasia, whereas dogs in the study had their elbow joints X-rayed for different reasons and not necessarily showed specific symptoms of this condition. This attitude proves reasonable, as clinical symptoms of elbow dysplasia are not always detectable and they may be manifested at different stages of ED progression. Therefore, a German Shepherd admitted to radiography due to an injury may be eventually diagnosed with elbow dysplasia, even though its symptoms had not been reported earlier.

The number of some breeds was too low to draw any general conclusions. Nevertheless, single cases were found in Basset Hounds (3 out of 42), Polish Hounds (1 out of 28), Shar Peis (1 out of 26), Bullmastiffs (1 out of 24), Pembroke Welsh Corgis (1 out of 15), and Skye Terriers (1 out of 14). Since the condition is not commonly known, it may be advisable to make breeders aware of this problem.

In marked contrast to groups II and VIII, the dogs of group V - Spitz and Primitive Type Dogs (120 studied), group VII - Pointing Dogs (440), and group X - Sighthounds (147) were perfectly free of elbow dysplasia. Additionally, several breeds of groups with high incidence of this anomaly did not prove a single case, even though numbers were relatively high. Great Danes, undoubtedly a large and rapidly growing breed, which is reported by different authors (9) as extremely prone to elbow dysplasia, did not show any case in 220 dogs studied. Neither did Miniature Schnauzers (181), reported by Sprinkle and Krook (16) among the breeds with high incidence of ED, Poodles (796), Dobermans (514), Yorkshire Terriers (342), Schnauzers (146), and Polish Lowland Sheepdogs (133). No case of elbow dysplasia in random bred dogs was found.

Table 1
Incidences of elbow dysplasia in different breeds

FCI group	Section	Breed	ED free		Dysplastic		Total
			N	%	N	%	
I. Sheepdogs and Cattle Dogs		Tatra Sheepdog	85	100.0			85
		Collie Rough	159	9.4	1	0.6	160
		Shetland Sheepdog	32	97.0	1	3.0	33
		Polish Lowland Sheepdog	133	100.0			133
		Welsh Corgi Pembroke	14	93.3	1	6.7	15
		German Shepherd	2682	98.3	47	1.7	2729
		Other	166	100.0			166
II. Pinschers and Schnauzers, Molossians and Swiss Mountain- and Cattle Dogs,	Pinscher and schnauzer	Russian Black Terrier	52	98.1	1	1.9	53
		Doberman	514	100.0	0		514
		Miniature Pinscher	433	100.0	0		433
		Miniature Schnauzer	181	100.0	0		181
		Giant Schnauzer	408	98.1	8	1.9	416
		Schnauzer	146	100.0	0		146
	Molossoid Mountain type	St. Bernard	109	98.2	2	1.8	111
		Newfoundland	104	95.4	5	4.6	109
		Caucasian Shepherd	254	98.8	3	1.2	257
		Other	29	100.0	0		29
	Molossoid	Bullmastiff	23	95.8	1	4.2	24
		Dogue de Bordeaux	86	91.5	8	8.5	94
		Mastiff	24	92.3	2	9.1	26
		Neapolitan Mastiff	88	91.7	8	8.3	96
		Boxer	867	99.9	1	0.1	868
		Bulldog	44	97.8	1	2.2	45
		Great Dane	220	100.0	0		220
		Rottweiler	1252	98.0	25	2.0	1277
		Shar Pei	25	9.2	1	3.8	26
		Swiss Mountain and Cattle dogs	Bernese Mountain Dog	83	97.6	2	2.4
III. Terriers	Large and medium sized Terriers	Total	377	100.0			377
		Small sized Terriers					
	Bull type Terriers	Skye Terrier	13	92.8	1	7.2	14
		Other	41	100.0			41
	Toy Terriers	American Staffordshire Terrier	172	98.9	2	1.1	174
Bullterrier		118	100.0			118	
	Yorkshire Terrier	342	100.0			342	
IV. Dachshunds		Total	3298	99.5	17	0.5	3315
V. Spitz and Primitive Types		Chow Chow	30	100.0			30
	Nordic Sledge Dogs	Total	73	100.0			73
		European Spitz	17	100.0			17
VI. Scenthounds and related breeds		Basset Hound	42	93.3	3	6.7	45
		Polish Hound	27	96.4	1	3.6	28
		Dalmatian	138	100.0			138
		Other	79	100.0			79
VII. Pointing Dogs		Total	440	100.0			440
VIII. Retrievers, Flushing and Water dogs	Retrievers	Golden Retriever	65	95.6	3	4.4	68
		Labrador Retriever	90	95.7	4	4.3	94
	Flushing dogs	Cocker Spaniel	504	100.0			504
IX. Companion and Toy Dogs		Pekingese	137	100.0			137
		Poodle	796	100.0			796
		French Bulldog	125	99.2	1	0.8	126
		Pug	41	100.0			41
		Other	49	100.0			49
X. Sighthounds		Total	147	100.0			147
	Random bred		5748	100.0			5748
	Total		21 122	99.29	150	0.7	21272

Table 2
Incidences of various forms of elbow dysplasia in different breeds of dogs with ED

Breed	UAP		FCP		UAP and FCP		EA		JI	OCD	Total
	N	%	N	%	N	%	N	%	N	N	N
Collie Rough			1	100							1
Shetland Sheepdog			1	100							1
Welsh Corgi Pembroke							1	100			1
German Shepherd	27	57.4	15	31.9	5	10.6					47
Russian Black Terrier	1	100									1
Giant Schnauzer	2	25.0	6	75.0							8
St. Bernard	1	50.0					1	50.0			2
Newfoundland			5	100							5
Caucasian Shepherd	1	33.3	1	33.3	1	33.3					3
Bullmastiff			1	100							1
Dogue de Bordeaux			7	87.5	1	12.5					8
Mastiff			1	50.0	1	50.0					2
Neapolitan Mastiff	3	37.5	3	37.5	1	12.5	1	12.5			8
Boxer			1	100							1
Bulldog			1	100							1
Rottweiler	3	12.0	21	84.0	1	4.0					25
Shar Pei			1	100							1
Bernese Mountain Dog			2	100							2
Skye Terrier							1	100			1
American Staffordshire Terrier			2	100							2
Dachshunds	6	33.5	11	66.5							17
Basset Hound	3	100									3
Polish Hound	1	100									1
Golden Retriever			3	100							3
Labrador Retriever			4	100							4
French Bulldog							1	100			1
Total	48	32.0	87	58.0	10	6.7	5	3.3	0	0	150

Among all cases of ED (total 150), 87 cases of FCP, and 48 cases of UAP the coexistence of both conditions were found in 10 dogs. Additionally, five cases of EA were diagnosed. Severe degenerative changes in these animals made it impossible to diagnose their primary cause. Neither JI nor OCD cases were found in that group.

As in most breeds studied, the numbers were relatively low and it was not possible to establish any breed-specific predisposition (Table 2). FCP constituted the majority of cases; half of those were UAP, and none – JI and OCD.

In this material, the highest incidence of UAP (57.4%) was diagnosed in German Shepherds with elbow dysplasia. UAP as a main cause of ED was diagnosed by Corley *et al.* (5). The authors found ED in almost half of the German Shepherds examined. As a primary cause of ED in German Shepherds, UAP was reported by Tellhelm *et al.* (17). Conversely, Remy *et al.* (15) demonstrated that UAP was most rarely diagnosed (4.5%). The authors explained that this might have resulted from the pre-screening.

The highest incidence of FCP in those breeds where ED occurred, in more than single cases was

reported in Dogues de Bordeaux (87.5%), Rottweilers (84.0%), and Giant Schnauzers (75.0%). Some authors (6, 18) reported the highest incidence of FCP in all examined Rottweilers, while the second breed most commonly affected was Bernese Mountain Dog. In this breed, two cases of ED were found in a study performed on 85 dogs; both caused by FCP. Hazewinkel (10) diagnosed ED in 64% of Bernese Mountain Dogs, FCP in 50.5% and JI in 54.3%. Interestingly, the incidence of ED in those breeds in different studies was significantly higher – more than 50%. Both conditions were most frequently present in Mastiffs and German Shepherds. Remy *et al.* (15) found that combinations of lesions were very frequent in German Shepherds and it was primarily the combination of JI and FCP. Similar results were reported by Padgett *et al.* (14).

References

1. Audell L.: Heredity of elbow dysplasia: Can elbow dysplasia be controlled by judicious breeding. Proc Am Anim Hosp Assoc Meeting 1990, pp. 730-733.
2. Beuing R., Mues CH., Tellhelm B., Erhardt G.: Prevalence and inheritance of canine elbow dysplasia in German Rottweiler. J Animal Breed Genet 2000, **117**, 375-383.
3. Blenau B.: Radiographic diagnosis of selected bone diseases. Magazyn Weter 1993, **2**, 16-17.
4. Carlson W.D., Severin G.: Elbow dysplasia in the dog. J Am Vet Med Assoc 1961, **138**, 295.
5. Corley E.A., Sutherland T.M., Carlson W.D.: Genetic aspects of canine elbow dysplasia. J Am Vet Med Assoc 1968, **153**, 543-547.
6. Grondalen J.: Occurrence and genetic aspects of elbow dysplasia. Proceedings of International Elbow Working Group, Constance (Germany) 1995, pp. 12-17.
7. Grondalen J.: Occurrence and genetic aspects of elbow dysplasia. Vet Comp Orthopaed Traumatol 1996, **9**, 60-61.
8. Guthrie A., Pidduck H.G.: Heritability of elbow osteochondrosis within a closed population of dogs. J Small Anim Pract 1990, **31**, 93-96.
9. Hazewinkel H.A.W.: Elbow dysplasia: clinical aspects and screening programs. 28th WSAVA Congress, 2003, **152**, pp. 11-14.
10. Hazewinkel H.A.W., Ubbink G.J.: Elbow dysplasia in the Dutch Bernese mountain dog population. Proceeding of International Elbow Working Group, Orlando (USA), 1999, p. 23.
11. Morgan, J.P., Wind A., Davidson A.P.: Bone dysplasias in the Labrador Retriever: A radiographic study. J Am Anim Hosp Assoc 1999, **35**, 332-340.
12. Morgan J.P.; Wind A.; Davidson A.P.: Hereditary bone and joint diseases in the dog: osteochondrosis, hip dysplasia, elbow dysplasia. Schlutersche Ed., Hannover, 2000, p. 314.
13. Narojek T.: Radiographic aspects of selected cases of ununited anconeal process in dogs. Medycyna Wet 1988, **11**, 687-691.
14. Padgett G.A., Mostosky U.V., Probst C.W.: The inheritance of osteochondrosis dissecans and fragmented coronoid process of the elbow joint in Labrador Retrievers. J Am Anim Hosp Assoc 1995, **31**, 327-330.
15. Remy D., Neuhart L., Fau D., Genevois J.P.: Canine elbow dysplasia and primary lesions in German shepherd dogs in France. J Small Anim Pract 2004, **45**, 244-248.
16. Sprinkle T.A., Krook L.: Hip dysplasia, elbow dysplasia and "eosinophilic panosteitis". Three clinical manifestations of hyperestrinism in the dog? Cornell Vet 1969, **60**, 476-490.
17. Tellhelm B., Schleich S., Beuing R., Pracht P.: Elbow dysplasia in a randomized population of German Shepherd dogs; results of different screening methods. Proceedings of International Elbow Working Group, Amsterdam (Netherlands), 2000, p. 11.
18. Wind A.P., Packarda M.E.: Elbow incongruity and developmental elbow diseases in the dog. J Am Anim Hosp Assoc 1986, **22**, 711-730.
19. Wind A.P., Packarda M.E.: A possible association between dysplastic joints in Labrador Retrievers. Proceedings of International Elbow Working Group, Orlando (USA), 1999, pp. 17-21.
20. Wolvekamp P.: The many faces of elbow dysplasia. 7th WSAVA Congress, 2002, pp. 2613-2615.