

A Comparison of Numerical Values of X-Ray Morphometrical Parameters Between Rottweilers and Other Dog Breeds in Diagnostics of Hip Dysplasia
Rentgenomorfometrisko parametru skaitlisko vērtību salīdzinājums starp rotveileru un citu suņu šķirnēm gūžu locītavu displāzijas diagnostikā

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Abstract. Investigations were carried out at the Clinical Institute of the Faculty of Veterinary Medicine of the Latvia University of Agriculture. The aim and objectives of the investigations were to determine and compare the use of some x-ray morphometrical parameters of hip dysplasia in young Rottweilers and other dog breeds. X-ray morphometrical parameters used in diagnostics of hip dysplasia were determined: Norberg angle (X1), inclination angle (X2), tangential angle (X3), location of geometrical centre of femoral head (X4), width of the lateral joint gap (X5), width of the medial joint gap (X6), and distraction index (X7). Agreement or differences between x-ray morphometrical parameters were established in Rottweilers and other dog breeds. Radiography was made in the ventrodorsal projection. The obtained data of x-ray morphometrical parameters were used for analysis. In case of hip dysplasia (HD), differences between some parameters were established within a breed, as well as between Rottweilers and other dog breeds. Evaluating numerical indices of the examined parameters it was established that Norberg angle (X1) is informative enough and does not depend on the dog breed, and may be used in diagnostics of hip dysplasia without determining other parameters. The possible inadequacy between Norberg angle and HP diagnosis is within a range of 3-4%. Parameters (X2-X7) are partly or insufficiently informative to be used in HD diagnostics without determining the Norberg angle (X1).

Key words: hip dysplasia, breed, dog, measurements.

Introduction

Morgan and Stephens (1988), and Tamilson and Mc Laughing (1995) are of the opinion that hip dysplasia (HD) is a multifactorial, genetically determined biomechanical development disease (usually bilateral) characterized by inadequately formed hip joints, which is later accompanied by a secondary degenerative joint arthrosis. Different forms of hip dysplasia occur in various species of animals, as well as in human beings, but as an important clinical problem HD is observed just in dogs because hip joints form an anatomical structure that holds the caudal part of the dog's body on two small spherical surfaces – femoral heads –, and they are involved in various body movements and positions (Morgan, Stephens, 1988). Even though there have been great achievements in veterinary medicine and public knowledge about animal keeping and nutrition during the last decades, Alexander (1992) has come to a conclusion that a comparatively little progress has been reached in terms of prevention of this severe

disease. Suffering in dogs affected by hip dysplasia is reduced by applying improved medicine and modern surgery techniques, nevertheless the problem has not been solved (Alexander, 1992). The fact that heredity of hip dysplasia has been established in 14 generations of dogs (Белов и др., 1990) suggests HD is a serious problem.

Brass and Paatsama (1983) and Impellizeri et al. (2000) have pointed out that HD most often occurs in large fast-growing breeds of dogs.

Morgan's (1988) studies show that, firstly, hip joints in 4-8 months old dogs are not completely developed, which is why x-ray diagnostic parameters may be different, and, secondly, HD clinical and radiographic picture in dogs may be similar to other hip joint diseases, e.g., changes of traumatic nature, dystrophies, abnormalities caused by Leg Perthes disease, and others.

Taking into consideration these factors, several criteria are developed and suggested for analyzing and estimating x-ray photographs. They are based on

measurements of the correlated position and angles of the hip acetabulum, femoral head, and femoral neck in case of normal condition and dysplasia (Kapatkin et al., 2004). It is of great importance to investigate these parameters in young dogs because the changes associated with hip dysplasia are not always apparent radiographically (Lust et al., 2001; Mayhew et al., 2002).

The objectives of the research were to determine mutual correlations among some morphometrical measurements of the hips and their use in the diagnostics of hip dysplasia.

The scientific novelty of the research is associated with the evaluation of statistical significance of some morphometrical parameters in order to optimize the evaluation of radiograms and to reduce subjectivity in evaluation making diagnosis "hip dysplasia".

The aim and objectives of the research were:

- 1) to determine x-ray morphometrical parameters used in diagnostics of hip dysplasia: Norberg angle (X1), inclination angle (X2), tangential angle (X3), location of geometrical centre of femoral head (X4), width of the lateral joint gap (X5), width of the medial joint gap (X6), and distraction index (X7);
- 2) to investigate correlations among x-ray morphometrical parameters in case of hip dysplasia in Rottweilers and other dog breeds;
- 3) to investigate agreement or differences between x-ray morphometrical parameters in Rottweiler breed dogs;

- 4) to investigate agreement or differences between x-ray morphometrical parameters in other dog breeds;
- 5) to carry out a comparative verification of some x-ray morphometrical parameters by multifactorial and unifactorial regression analysis between Rottweilers and other dog breeds in case of hip dysplasia;
- 6) to investigate correlations between some x-ray morphometrical parameters within a breed, as well as between Rottweilers and other dog breeds.

The basic aim of the research was to reduce subjectivity in evaluation of x-ray photographs.

Materials and Methods

Sixty two dogs of different breeds, sex, and age, exhibiting different-degree fore- and hind limb lameness of uncertain etiology, were examined (Table 1).

The x-ray examination was made using PHILIPS MCD 125 No. 0 41 WB 18E01 x-ray appliance in compliance with the requirements of the International Association of Cynology (FCI). A template (25305-S) with a circle diameter of 4-40 mm and protractor LOGAREX 34023 were used to determine the x-ray morphometrical parameters.

To make a good radiography, the animals were anesthetized applying a combination of 100 mg ml⁻¹ of ketamine and 5 mg ml⁻¹ of diazepam (valium) – 1 ml per 10 kg of body weight. After that, the dog was fixed on its back, and radiography was made in the

Table 1

Breed, sex and age of the examined dogs

Breed	Sex		Age		Total number of dogs
	female	male	under 1 year	over 1 year	
Rottweiler	9	27	32	4	36
Mastino Napoletano	1	5	5	1	6
Chow Chow	1	4	4	1	5
German Sheperd	2	3	3	2	5
Caucasian Sheepdog	–	3	2	1	3
Staffordshier Terrier	–	2	–	2	2
Landseer	–	1	–	1	1
Doberman Pinscher	–	1	–	1	1
Bull Terrier	–	1	1	–	1
Mid-Asian Sheepdog	1	–	1	–	1
Bullmastiff	1	–	–	1	1
Total number of dogs	15	46	47	14	62

ventrodorsal projection with stretched and parallel placed hind legs.

The data of x-ray morphometrical parameters, obtained as a result of radiographical examination of hip joints in the dorsoventral standard position, were used for expanded analysis.

Radiographical parameters of hip joints, from X1 to X7, were determined in radiograms. The measurement results were arranged according to the dog breed (Rottweilers and other dog breeds) and separately for the right and left hip joint. The aim of further calculation was to find out whether the difference in mean values of the right (LX1–LX7) and left (KX1–KX7) hip joint parameters between Rottweilers and other dog breeds is significant.

In case of hip dysplasia, differences in some parameters were established within a breed, but differences in some x-ray morphometrical parameters – between Rottweilers and other dog breeds. Using the data of linear regression analysis in uncertain cases with Rottweiler breed dogs in order to verify the diagnosis according to the significance of factors, it is suggested to use the following morphometrical parameters: medial joint gap (X6), tangential angle (X3), inclination angle (X2), location of geometrical centre of femoral head (X4), and lateral joint gap (X5).

The statistical data processing was performed using Microsoft Excel 97. The arithmetical mean, mean standard error, and Student’s *t*-test were calculated in order to evaluate the confidence of differences of the obtained results (Arhipova, Bāliņa, 2003; Christensen, 1996).

Data were considered different when the confidence level was lower than 0.05 ($p < 0.05$ or $P = 95\%$).

Results

A comparison of mean values of morphometrical parameters of the right hip joint was made between Rottweilers and other dog breeds suffering from HD.

In Rottweiler breed dogs, hip dysplasia of the right hip joint was established in 24 (67% of cases) out of 36 examined dogs. In other breeds of dogs, the right hip dysplasia was found in 17 (65% of cases) out of 26 examined animals.

The mean values and standard error of the parameters from LX1 to LX7 of the right hip joint in Rottweilers and other dog breeds are given in Table 2.

Calculations showed that the average age of Rottweilers with HD is 8.2 months (standard error ± 0.93), but of other breed dogs with HD – 11.5 months (standard error ± 1.76).

By using *t*-test it was established that Rottweilers with HD are younger than other breed dogs with HD (with probability $P = 94\%$, which is close to significant).

Analysis (estimating by P-value percentage) of the mean indices of parameters LX1, LX2, LX3, LX4, LX5, and LX6 showed that there were no significant differences in the mean values of parameters between Rottweilers and other dog breeds affected with HD.

Calculating the mean value by variable LX7, it was found that in Rottweilers $X_{\text{mean}} = 0.45$ (dispersion 0.09). By using *t*-test it was established

Table 2

The mean values and standard error of morphometrical parameters of the right hip joint in Rottweilers and other dog breeds

Parameter	Unit of measurement	Rottweilers (n=24) mean± standard error	Other dog breeds (n=17) mean± standard error	Probability, P
LX1 (Norberg angle)	degrees	88.12 ± 2.57	86.58 ± 5.27	60%
LX2 (inclination angle)	degrees	136.86 ± 1.90	135.67 ± 1.89	67%
LX3 (tangential angle)	degrees	17.70 ± 3.61	9.82 ± 6.20	86%
LX4 (placement of the geometrical centre of the CFH)	mm	0.42 ± 0.67	-0.38 ± 1.09	73%
LX5 (lateral joint gap)	mm	1.70 ± 0.20	1.41 ± 0.22	82%
LX6 (medial joint gap)	mm	2.86 ± 0.22	3.06 ± 0.29	70%
LX7 (distraction index)		0.44 ± 0.07	0.31 ± 0.03	94%

Note: probability is significant if $P \geq 95\%$.

that with probability P=94% (which is close to significant), parameter LX7 in the right hip joint in Rottweilers is more expressed than in other dog breeds.

Comparison of the Mean Values of Morphometrical Parameters of the Left Hip Joint in Rottweilers and Other Dog Breeds

An analogous division of the left hip joint parameters was made. In Rottweiler breed dogs, hip dysplasia of the left hip joint was found in 23 (64% of cases) out of 36 examined dogs. In other breeds of dogs, a unilateral HD was observed in 16 (61% of cases) out of 26 examined dogs. The mean values and standard error of the evaluated parameters from KX1 to KX7 are presented in Table 3.

Analysis of the mean values of variables KX1, KX2, KX4, KX5, and KX7, as well as estimation of differences between the breeds show no significant differences in above-mentioned mean indices between Rottweilers and other dog breeds.

Calculating the mean value by variable KX6, in Rottweiler breed dogs $X_{\text{mean}}=2.88$ with dispersion of 0.26. By using *t*-test it was established that there is a significant difference with probability P=99%, i.e., in Rottweiler breed dogs with HD, the width of medial joint gap is larger than in other dog breeds.

Calculating the mean value by variable KX3 (tangential angle), in Rottweiler breed dogs $X_{\text{mean}}=22.56$ (dispersion 406.07), but in other breed dogs $X_{\text{mean}}=6.37$ (dispersion 581.45). By using *t*-test it was established that with probability P=97%, tangential angle in Rottweilers is larger than in other dog breeds.

Verification of Mutual Linear Relationship between Morphometrical Parameters of Rottweilers and Other Dog Breeds

Mathematical data processing was carried out to determine possible mutual relationship between parameters, i.e., between Norberg angle (X1) and other parameters (X2, X3, X4, X5, X6, and X7). Close, medium close, and poor linear relationship examples are seen in Figures 1-3.

At first, statistical data verification was performed to find whether all parameters are mutually independent. That is necessary to get to know by which of the variables the dog can be considered as hip dysplasia affected. A situation is possible that the result of one parameter duplicates the dependent parameter result. In such cases there is an opportunity to decline to use any of the parameters in making diagnosis of the disease.

In all examined animals, parameters of the right and left hip joint (X1-X6) were compared and verified whether they are mutually dependent. In the result of verification it was established that all the data form an uncorrelated group of points, which, in turn, indicates that all parameters are mutually independent.

In order to evaluate the linear relationship among parameters more precisely, a table with correlation coefficients between the parameters ($r=\pm\sqrt{R^2}$) was made (Table 4). It should be pointed out that correlation coefficient *r* characterizes only closeness of the linear relationship between the parameters.

Analysis of the obtained correlation coefficients demonstrates that there is linear relationship between some of the parameters. A **close** linear correlation can be predicted between Norberg angle (X1) and location of geometrical centre of femoral head (X4) ($r=0.82$), a **medium** linear correlation – between Norberg angle

Table 3

The mean values and standard error of the left hip joint

Parameter	Unit of measurement	Rottweilers (n=23) mean ± standard error	Other breed dogs (n=16) mean ± standard error	Probability, P
KX1 (Norberg angle)	degrees	90.56 ± 2.48	88.68 ± 4.16	65%
KX2 (inclination angle)	degrees	136.50 ± 2.88	138.63 ± 2.28	72%
KX3 (tangential angle)	degrees	22.56 ± 4.20	6.37 ± 6.02	97%
KX4 (placement of the geometrical centre of the CFH)	mm	-0.10 ± 0.61	0.37 ± 1.02	65%
KX5 (lateral joint gap)	mm	1.94 ± 0.23	1.78 ± 0.29	67%
KX6 (medial joint gap)	mm	2.88 ± 0.17	2.20 ± 0.13	99%
KX7 (distraction index)		0.30 ± 0.05	0.27 ± 0.07	62%

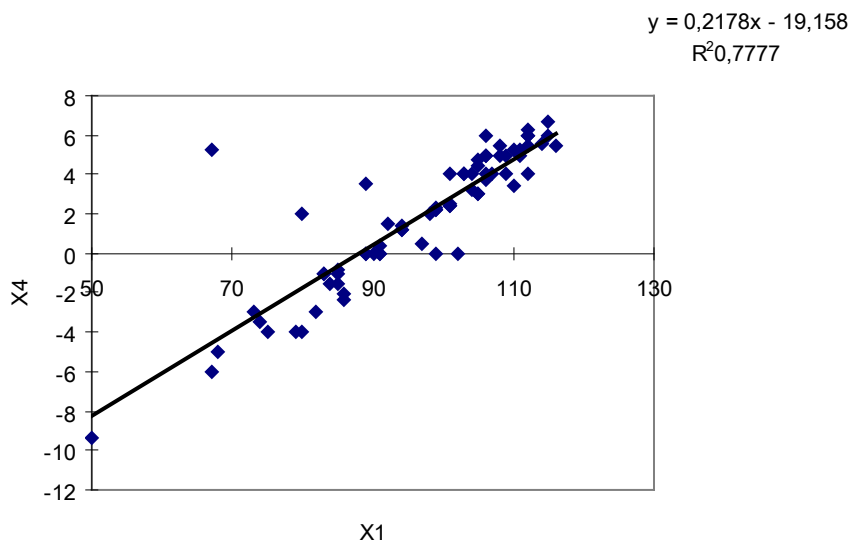


Fig. 1. A close correlation between Norberg angle (X1) and location of geometrical centre of femoral head (X4).

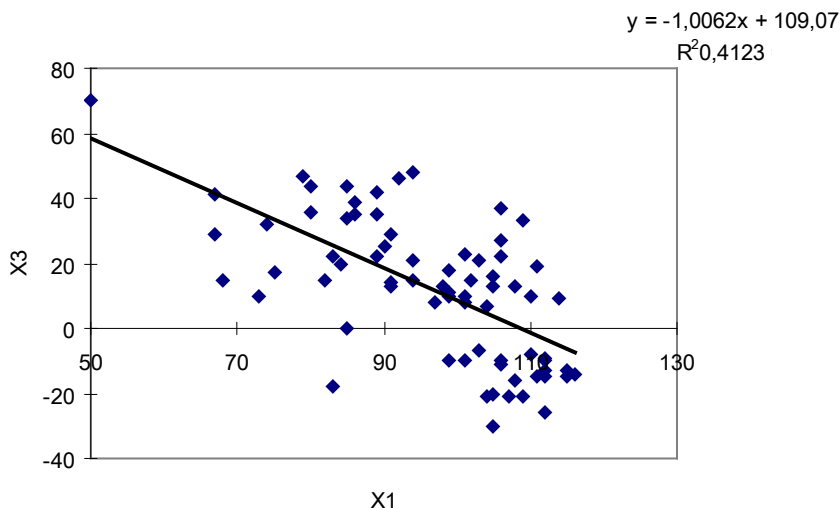


Fig. 2. A medium close correlation between Norberg angle (X1) and tangential angle (X3).

(X1) and tangential angle (X3) ($r=0.64$), whereas between other parameters – a **poor** or insufficient mutual relationship (correlation). The correlation is close, if $r=0.81$ or higher, medium – if $r=0.60-0.80$, and poor – if $r=0.60$ or lower.

Inadequacy of Morphometrical Parameters to HD Diagnosis in Rottweilers

Afterwards, health or clinical condition of dogs and its adequacy or inadequacy to the morphometrical parameters were examined.

Health or clinical condition of both Rottweilers and other dog breeds were evaluated as healthy (i.e., clinically there were no signs of lameness syndrome): the evaluated parameter (X1) was adequate to the norm (morphometrically hip dysplasia was not

established). And, contrariwise, both Rottweilers and other dog breeds were evaluated as clinically ill because the lameness syndrome was observed: the evaluated parameter (X1) was not adequate to the norm (morphometrically hip dysplasia was established).

The obtained data show diversities in diagnosing lameness, i.e., lameness is diagnosed but x-ray morphometrical parameters are adequate to the norm (the morphometrical parameter is not changed which does not indicate hip dysplasia), and, vice versa, there are no signs of lameness syndrome but x-ray morphometrical parameters do not correspond to the norm (morphometrical parameters indicate hip dysplasia).

The total number of observations, their adequacy or inadequacy to the norm, and percentage of

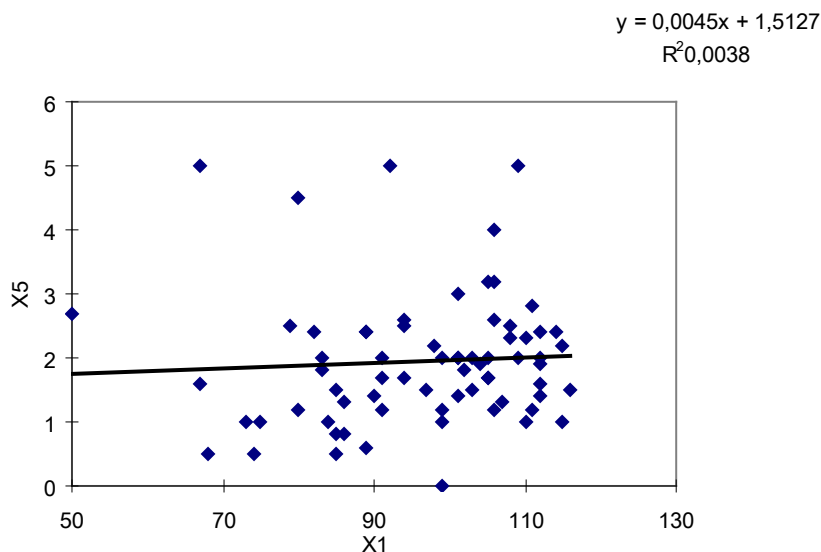


Fig. 3. A poor correlation between Norberg angle (X1) and the width of lateral joint gap (X5).

Table 4

Correlation coefficient (r) between parameters of hip joints in Rottweilers and other dog breeds with hip dysplasia

Parameters	X1	X2	X3	X4	X5	X6	X7
X1	1	0.09	0.64	0.82	0.06	0.03	0.38
X2		1	0.15	0.01	0.03	0.35	0.14
X3			1.	0.50	0.28	0.16	0.01
X4				1	0.09	0.29	0.20
X5					1	0.04	0.18
X6						1	0.40
X7							1

Notations: X1 – Norberg angle, X2 – inclination angle, X3 – tangential angle, X4 – location of geometrical centre of femoral head, X5 – width of the lateral joint gap, X6 – width of the medial joint gap, and X7 – distraction index.

inadequacy are presented in Table 5. Evaluating the numerical indices of the examined parameters, it may be hypothetically affirmed that parameter X1 in Rottweilers is informative enough and may be used in HD diagnostics without establishing other parameters. Parameter X3 is partly informative, but parameters X2, X4, X5, X6, and X7 are not informative enough to be used in HD diagnostics without establishing other parameters.

Inadequacy of Morphometrical Parameters to HD Diagnosis in Other Dog Breeds

Parameters of hip joints in other dog breeds were evaluated and grouped similarly as in Rottweilers. Table 6 demonstrates data of the total number of observations, their adequacy to the norm, as well as percentage of inadequacy. The data suggest that parameter X1 in other dog breeds is informative

enough to be used in HD diagnostics without establishing other parameters. Parameter X6 is partly informative, but parameters X2, X3, X4, X5, X6, and X7 are not informative enough to be used in HD diagnosis in other dog breeds without establishing numerical values of other parameters.

Adequacy of Morphometrical Parameters to HD Diagnosis in Rottweilers and Other Dog Breeds

At the next stage of the research, verification of the adequacy of the variable X1 to the norm and diagnosis was carried out. It was assumed that clinical examinations are not adequate to the diagnosis of hip dysplasia in the following cases:

- parameter X1 is inadequate to the norm (HD was established radiographically) but the dog is clinically healthy;

Table 5

The inadequacy of examinations to HD diagnosis in Rottweilers

Indices	Number of examinations						
	X1	X2	X3	X4	X5	X6	X7
Inadequate	2	25	14	23	36	18	14
Adequate	70	39	58	40	34	50	48
Total	72	64	72	72	70	68	29
Inadequate, %	3	39	19	32	51	26	48

Notations: see Table 4.

Table 6

The inadequacy of examinations to HD diagnosis in other dog breeds

Indices	Number of examinations						
	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇
Inadequate	2	25	18	20	22	15	10
Adequate	50	25	34	32	28	33	7
Total	52	50	52	52	50	48	17
Inadequate, %	4	50	35	38	44	31	59

Notations: see Table 4.

Table 7

The adequacy of indices of Norberg angle to HD diagnosis

Breed	Number of examinations		
	Adequate	Inadequate	Total
Rottweilers	2	70	72
Others	2	50	52
Total	4	120	124

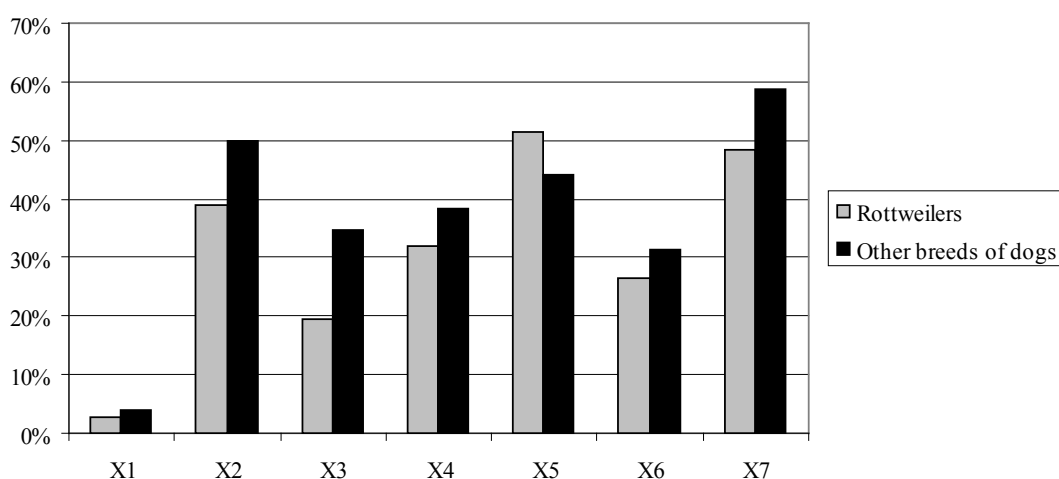


Fig. 4. The inadequacy of the lameness syndrome, observed clinically, to morphometrical diagnosis (HD) in Rottweilers and other dog breeds.

- parameter X1 is adequate to the norm (HD was not established radiographically) but the dog is clinically ill.

Changes in attributes depending on the breed of a dog are given in Table 7.

The adequacy of the division of the observation number of qualitative samples to the division of the theoretical observation number is verified by χ^2 method.

It was established that the inadequacy of the parameter X1 measurements to the diagnosis does not depend on the breed of a dog ($P=95\%$). Consequently, it can be concluded that the dog of any breed is healthy if parameter X1 is adequate to the norm, but the dog is ill with hip dysplasia if the parameter is inadequate to the norm. The inadequacy of the Norberg angle parameters to the norm and diagnosis varies within 3-4%. This suggests that parameter X1 can be used in HD diagnostics independently of other parameters, but the other parameters (X2 to X7) should be used to make the diagnosis more precise.

Discussion

Analysis of the mean indices of morphometrical parameters LX1, LX2, LX3, LX4, LX5, and LX6 showed that there are no significant differences in the mean values of parameters between Rottweilers and other dog breeds with HD (estimating by P value percentage).

Comparing morphometrical parameters between the right and left hip joints in Rottweilers and other dog breeds, it was established that the distraction index (LX7) in Rottweilers is more expressed and is close to significant ($P=94\%$). In the left hip joint there were significant differences in parameters of medial joint gap (KX6) ($P=99\%$) and tangential angle (KX3) ($P=95\%$), i.e., in Rottweilers these parameters are more expressed than in other dog breeds.

Evaluating linear relationship between parameters, it may be predicted that there is a close linear correlation ($r=0.82$) between Norberg angle (X1) and location of the geometrical centre of the femoral head (X4), a medium linear correlation ($r=0.64$) between Norberg angle (X1) and tangential angle (X3), but between other parameters there is a poor or insufficiently close mutual relationship (correlation).

In compliance with the criteria accepted by FCI (Federation Cynologique Internationale) in 1983, the Norberg angle value is one of the most universal morphometrical parameters in hip dysplasia diagnostics (Morgan, Stephens, 1988; Banfield, Bartels, 1996; Slatter, 1985; Whittick, 1974; Cook et al., 1996), which is also confirmed by our study. The

established inadequacy of this parameter to diagnosis is within the range of 3-4%. In cases when the inadequacy of the Norberg angle between the norm and diagnosis is within the range of 3% in Rottweilers and within the range of 4% in other dog breeds, it is possible to apply linear regression analysis to find out which of the parameters (X2-X6) is more informative and can be used in making a more precise diagnosis of hip dysplasia.

The present study proves that Norberg angle is the most relevant and universal morphometrical parameter to confirm diagnosis of HD according to FCI requirements and this measurement is not affected by the breed of a dog as well.

Norberg angle. In compliance with FCI requirements, dogs with the size of Norberg angle 105° or more are considered HD unaffected or free of HD (Brass, Paatsama, 1983). In the present research, the Norberg angle value in Rottweiler breed dogs was from 67° to 104° with the average value of $88.12^\circ \pm 2.57^\circ$, but in other dog breeds – from 76° to 104° with the average value of $86.58^\circ \pm 5.27^\circ$, which indicates hip dysplasia.

Inclination angle. In the literature, authors' opinions on the normal values of the inclination angle differ. Fox and Burt (1996) consider that a normal inclination angle should be 145° . Hauptman et al. (1985), and Retenmaier and Constantinescu (1991) are of a similar opinion: a normal value of this angle is 146° . Braden and Prieur (1992), in turn, believe that the average inclination angle is 149° varying within the range from 141° to 157° .

In the examined Rottweilers, value of the inclination angle was from 115° to 165° with the average value of $136.86^\circ \pm 1.90^\circ$, but in other dog breeds – from 119° to 153° with the average value of $135.67^\circ \pm 1.89^\circ$, which suggests that in the examined dogs the average value of this angle is smaller – within the range from 141° to 157° .

Banfield and Bartels (1996) had established that the average value of the inclination angle in healthy German Shepherds was $13.49^\circ \pm 5.00^\circ$, but in healthy Belgian Malinois – $132.55^\circ \pm 4.51^\circ$. Whereas in dogs affected with hip dysplasia, the average value of the inclination angle was: $132.58^\circ \pm 5.35^\circ$ in German Shepherds, and $128.69^\circ \pm 3.39^\circ$ in Belgian Malinois.

Tangential angle. Hauptman et al. (1985) have pointed out that there is a correlation between the subluxation force (the value is not mentioned) and craniodorsal side slope of the acetabulum (tangential angle). At a smaller subluxation force (the value is not mentioned) the tangential angle is 18° , but at a larger subluxation force (the value is not mentioned) the tangential angle is 40° .

Using Mitin's skiagram, Belov et al. (Белов и др., 1990) have found that a negative tangential angle corresponds to the norm, whereas a positive tangential angle (the values of angles are not mentioned) is observed in pathological cases.

In our research, the tangential angle of the left hip joint in Rottweilers was from minus 30° to plus 48° with the average value of 17.70°±3.61°, but in other dog breeds – from minus 38° to plus 63° with the average value of 9.82°±6.20°.

Location of the geometrical centre of the femoral head. If the geometrical centre of the femoral head is located laterally of the sagittal line (drawn parallel to the longitudinal axes of the body), it indicates a subluxation of the relevant joint (one of HD signs). Morgan and Stephens (1988) have described a method that can be used in making HD diagnosis. We supplemented this method with positive and negative numerical values. The medial location of the geometrical centre of the femoral head was indicated as a positive numerical value, but the lateral location – as a negative numerical value.

In Rottweilers, location of the geometrical centre of the femoral head against the sagittal line was from minus 9.4 mm to plus 6.7 mm with the average value of 0.42±0.67 mm, but in other breeds of dogs – from minus 5.5 mm to plus 6.4 mm with the average value of 0.38±1.09 mm.

Width of the lateral and medial joint gap. Banfield and Bartels (1996) do not indicate any correlation between the width of joint gaps and hip dysplasia.

In our study, the medial and lateral joint gap was measured in millimeters to be able to carry out further calculations and data analysis. In Rottweiler breed dogs, the width of the lateral joint gap was from 0.5 mm to 4.5 mm with the average value of 1.70±0.20 mm, but the width of the medial joint gap – from 1 to 5.5 mm with the average value of 2.86±0.22 mm. In other dog breeds, the width of the lateral joint gap was from 0.5 mm to 3.4 mm with the average value of 1.41±0.22, but the width of the medial joint gap – from 1.5 mm to 4.8 mm with the average value of 3.06±0.29 mm.

Distraction index. In the veterinary literature, Smith et al. (1990) are the first who wrote about the use of distraction index (DI) method. The index applied in the new method is fixed from 0 to 1, where 0 means complete joint congruence, and 1 – extreme joint laxity. The permissible standard or amount of distraction index is 0.3 (Smith, 1997).

According to Smith et al. (1990), the recommended projection for calculation of DI is dorsoventral position of the animal with hind legs perpendicularly lifted and forcedly laterally spread in hip joints.

In our study, the formula to calculate the distraction index is equated to the classical dorsoventral position. The results showed that in Rottweilers the distraction index is from 0.07 to 0.99 with the average value of 0.44±0.07, but in other dog breeds – from 0.08 to 0.56 with the average value of 0.31±0.03.

Conclusions

1. The obtained results suggest that hip dysplasia as an orthopedic disease occurs in various fast growing dog breeds in Latvia. Hip dysplasia was established in 75% out of the total number of examinations.
2. Hip dysplasia comparatively more often occurs in Rottweiler breed dogs (in 42% out of the total number of cases, and in 72% out of the examined Rottweilers).
3. The value of Norberg angle is the most important and universal morphometrical parameter in HD diagnostics.
4. The tangential angle of the left hip joint (KX3) with probability P=97% in Rottweilers is larger than in other dog breeds affected with hip dysplasia.
5. The medial joint gap of the left hip joint (KX6) with probability P=99% is larger in Rottweilers than in other dog breeds.
6. The Norberg angle value does not depend on the breed of a dog (P=95%). The inadequacy between the norm and the diagnosis is 3-4%, indicating that parameter X1 (Norberg angle value) may be used in HD diagnostics independently of other parameters, but other parameters (X2-X7) should be used for making the diagnosis more precise.

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Anotācija

Pētījums veikts Latvijas Lauksaimniecības universitātes Veterinārmedicīnas fakultātes KĻīniskajā institūtā. Pētījuma mērķis bija noteikt un salīdzināt dažus rentgenomorfometriskos parametrus jauniem rotveileru un citu šķirņu suņiem gūžu locītavu displāzijas gadījumā. Rentgenogrammās, kas veiktas dorsoventrālajā standartpozīcijā, noteicām šādus gūžu locītavu morfometriskos parametrus: Norberga leņķi (X1), ciskas kaula kakla inklinācijas leņķi (X2), ciskas kaula kakla ģeometriskā centra novietojumu attiecībā pret sagitālo līniju, kas novilkta paralēli ķermeņa garenvirzienā, sākot no locītaviedobuma kraniodorsālās malas (X3), tangenciālo leņķi (X4), laterālo locītavas spraugas platumu (X5), mediālo locītavas spraugas platumu (X6) un distrakcijas indeksu (X7). Pēc tam tika veikta parametru savstarpēja salīdzināšana starp labo un kreiso gūžas locītavu, kā arī parametru vidējās vērtības salīdzināšana starp rotveileru un pārējo suņu šķirnēm. Pēc parametru salīdzināšanas konstatētas atsevišķu parametru atšķirības starp labo un kreiso gūžas locītavu gan šķirnes ietvaros, gan arī salīdzinājumā starp suņu šķirnēm. Novērtējot noteikto parametru skaitliskās vērtības, konstatēts, ka Norberga leņķa (X1) lielums ir pietiekami informatīvs, lai to varētu izmantot gūžu locītavu displāzijas diagnostikā bez pārējo parametru izmantošanas, un šī leņķa lielums nav atkarīgs no suņa šķirnes. Parametri no X2 līdz X7 ir daļēji informatīvi un tos var izmantot diagnozes noteikšanai un precizēšanai 3–4% neskaidro gadījumā.