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Short communication

Understanding ultrasonographic renal length-to-aorta ratio in Sighthounds: A breed specific study in Chippiparai dogs

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Abstract

Ultrasonographic renal length-to-aorta ratio is an ideal reflection of renal health in dogs. Earlier studies have highlighted the need for breed-specific reference intervals for this parameter. The aim of this study was to establish a breed-specific reference interval of kidney length to aorta ratio (KL:Ao) in Chippiparai dogs, a breed of Indian sighthounds. The KL:Ao ratio was recorded in 45 Chippiparai dogs, classified into 3 age groups. A narrow breed specific range of 7.07 to 7.74 was arrived at for adult Chippiparai dogs, and a strong relationship between age and body weight and KL:Ao was observed using regression analysis. These findings can be extrapolated and utilized by other sighthounds.

Keywords: Breed-specific Chippiparai, kidneys, kidney length to aorta ratio, sighthounds

Fig. 1. Young and adult Chippiparai dogs included in the study.

Introduction

The sighthounds, often referred to as "Canine speed merchants", are streamlined dogs of light frame, among which Greyhounds, Whippet, Saluki, Borzoi and Afghan hounds are recognised worldwide. Chippiparai, referred to as the "Greyhound of the South" is a medium sized sighthound indigenous to the southern state of Tamil Nadu, India.

Ultrasonographic renal length is a feasible and practical diagnostic parameter in assessing kidney size which may increase or decrease during disease processes. Since the absolute renal length varies widely due to the extreme breed variations among dogs, the ratio of kidney length (KL) to aortic luminal diameter (Ao) was recommended as a quick estimate of renal size (Mareschal et al. 2007). Although, the normal KL:Ao ratio range (5.5-9.1) covers small to large breeds, it is very wide, leaving room for misdiagnosis. It is anticipated that a breed specific reference interval for KL:Ao will provide a narrow range, which will be accurate for a particular breed and those similar to it.

Materials and Methods

The study was performed at the Veterinary Medicine Referral unit of the Department of Veterinary Medicine, VCRI Namakkal, Tamil Nadu, India. A total of 45 apparently healthy Chippiparai dogs – with no ultrasonographic renal abnormalities, normal hemogram and serum biochemical values – of both sexes were classified into three age-based groups: Group A (<6 months), Group B (6-12 months) and Group C (>12 months). The animals were included in the study with the owners' informed consent. No Ethics Agreement was required. The dogs included in this study were lean and muscular with no excess fat and tucked up abdomen (Fig. 1), with body condition score between 4 and 5, as per the nine points grading recommended by WSAVA. Unsedated dogs were physically restrained in the right /left lateral or dorsal recumbent positions as required. Transducer skin contact was achieved using acoustic coupling gel. Ultrasonography was performed using a 3.5-10 MHz convex electronic transducer. Ultrasonography was performed by a single observer throughout the study. Each kidney was preliminarily evaluated in order to rule out parenchymal alterations. The maximum length of both kidneys (KL) was assessed on still images with a clearly visible renal pelvis (Fig. 2) (Mareschal et al. 2007). The maximal aortic luminal diameter (Ao) during aortic pulsation was measured in both transverse and longitudinal views, caudal to the renal artery (Fig. 3) (Mareschal et al. 2007). For statistical analysis, the mean of the Ao values for the two viewpoints was used. Three measurements of each parameter were made, and the average result was noted, to minimize intra-observer error. The primary data was entered into Microsoft Excel and statistical analyses were performed using IBM SPSS Statistics, v.23. 0 software.

Results and Discussion

The Mean±SE specific for adult Chippiparai dogs, were – KL 63.10±1.21 mm; Ao 8.77±0.26 mm; KL:Ao 7.47±0.27 and KL:BW 3.2±0.38. The KL:Ao ratio obtained was narrower than the general canine range in a previous study (Mareschal et al. 2007). The findings of this study were in agreement with Lobacz et al. (2012) who emphasized the need for breed specific

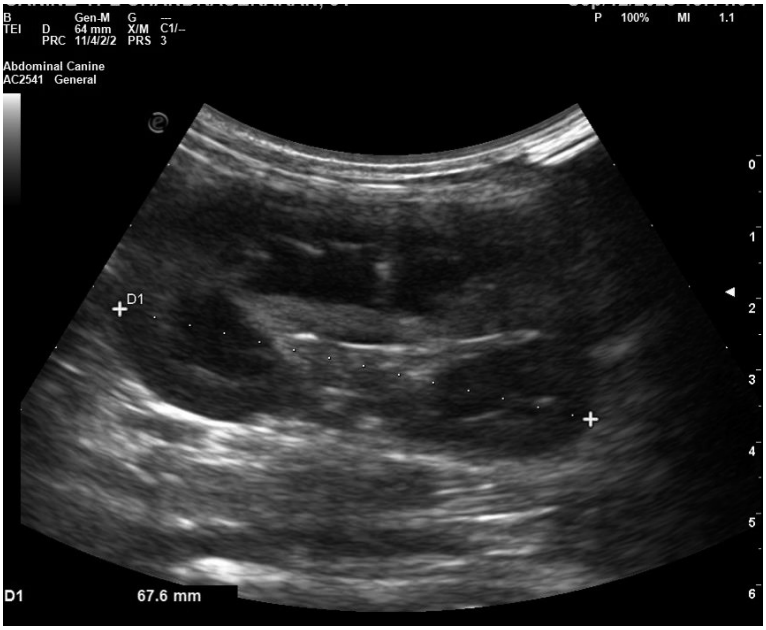

Fig. 2. Measurement of kidney length (KL).

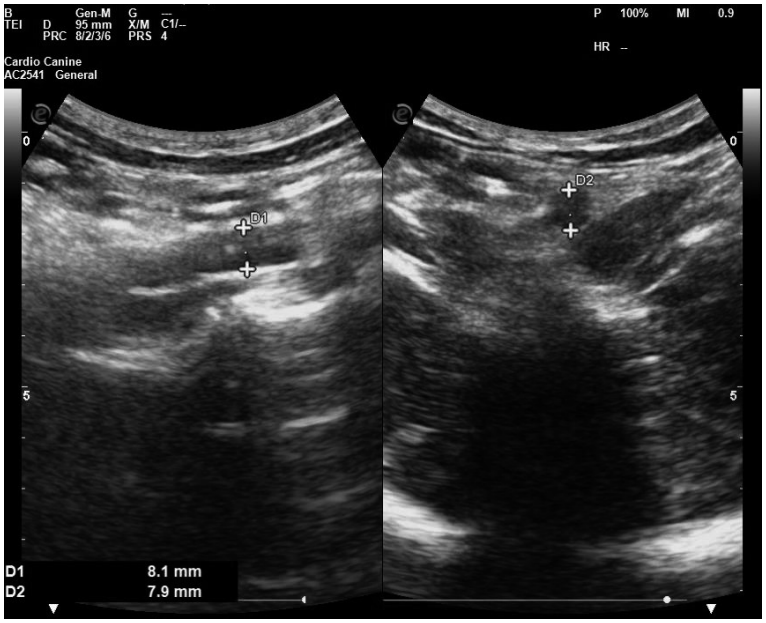

Fig. 3. Measurement of aortic luminal diameter in longitudinal and transvese section (Ao).

reference intervals as significant differences of kidney length to the length of the 2nd lumbar vertebra ratio were present between brachycephalic and dolichocephalic dogs. The results of this study can be used as a reference for other sight hounds of similar body weights until breed specific values are established.

Effect of age and body weight

A significant difference in KL, Ao and KL:Ao ratio was observed between the three age groups (Table 1). The significantly greater KL:BW and KL:Ao ratios of Chippiparai dogs aged less than 6 months is suggestive of larger kidneys relative to body weight and diameter of the abdominal aorta. Post hoc tests showed homogeneity of KL:Ao between dogs aged 6 to 12 months and those more than 12 months, similar to the findings of an earlier study (Kawalilak et al. 2019). The KL:Ao and KL:BW ratios show a declining trend with age (Tables 1 and 2, Fig. 4). These findings can be attributed to rapid growth, with drastic weight gain in young animals with a simultaneous increase in renal size and aortic diameter, in a non-linear fashion. Growth and increase in body weight, however, slows down towards the end of the first year and is almost negligible after the second year (24 months) ie. kidney length does not

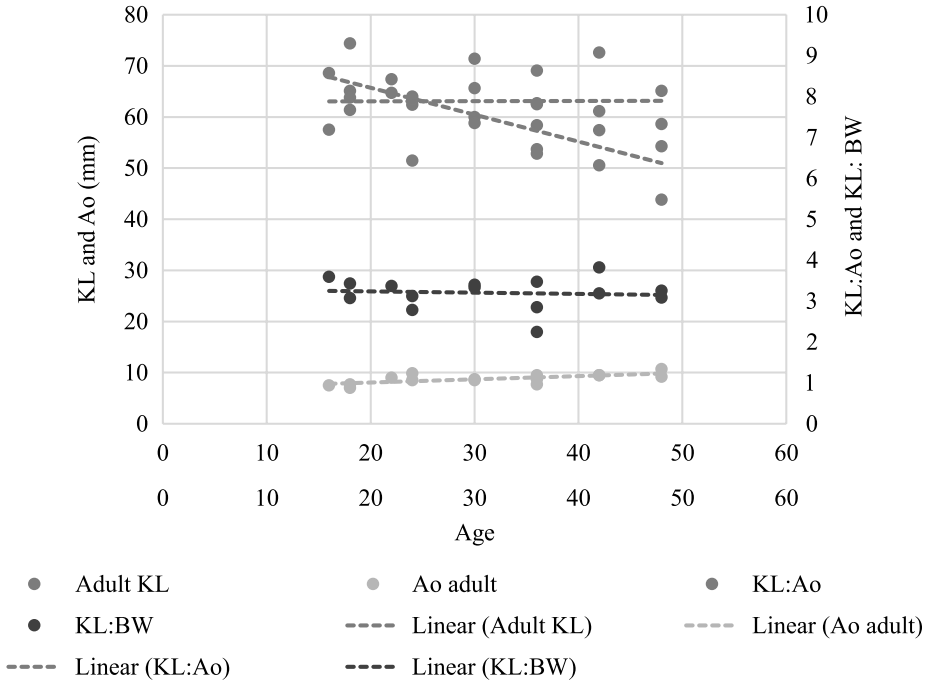

Fig. 4. Relationship of age with kidney length (KL), aortic luminal diameter (Ao), kidney-to-aorta ratio (KL:Ao) and kidney length to body weight ratio (KL:BW) in adult Chippiparai dogs.

Table 1. Mean ± Standard error and 95% confidence intervals for age, body weight, kidney length (KL), aortic luminal diameter (Ao), kidney-to-aorta ratio (KL:Ao) and kidney length to body weight ratio (KL:BW) recorded in Chippiparai dogs of different age groups of this study.

Parameter		Group A (<6 months)	Group B (6-12 months)	Group C (>12 months)	F - value
Age (months)	Mean±SE	3.47±0.23	9.60±0.62	31.33±2.79	122.449**
	95% Confidence Interval for Mean	2.94-3.96	8.45-11.28	27.19-36.81	
Body weight (kg)	Mean±SE	7.20±0.37	15.40±0.95	19.93±0.88	87.787**
	95% Confidence Interval for Mean	6.41-7.99	13.36-17.44	18.60-21.26	
KL (mm)	Mean±SE	51.74±0.76[a]	59.77±1.48[b]	63.10±1.21[b]	41.878**
	95% Confidence Interval for Mean	50.26-53.23	56.23-60.59	60.51-65.69	
Ao (mm)	Mean±SE	5.33±0.13	7.16±0.27	8.77±0.25	56.567**
	95% Confidence Interval for Mean	5.05-5.61	6.58-7.75	8.22-9.33	
KL:Ao	Mean±SE	9.7±0.25[a]	8.27±0.25[b]	7.47±0.27[b]	20.305**
	95% Confidence Interval for Mean	9.23-10.32	7.73-8.82	6.88-8.05	
KL:BW	Mean±SE	7.42±1.17	4.04±0.78	3.20±0.38	105.517**
	95% Confidence Interval for Mean	6.77-8.07	3.61-4.47	2.99-3.41	

** indicate significant variance between the three groups (One-way ANOVA). [a,b] indicate homogenous subsets among the the three groups (Post HOC Waller-Duncan test).

Table 2. Correlation of age and body weight with kidney length (KL), aortic luminal diameter (Ao), kidney-to-aorta ratio (KL:Ao) and kidney length to body weight ratio (KL:BW) in dogs of all three age-groups combined and that of adult dogs (Group C) alone.

	All groups combined				Adults			
	KL	Ao	KL:Ao	KL:BW	KL	Ao	KL:Ao	KL:BW
Age (months)	0.584**	0.835**	-0.699**	-0.675**	0.008	0.675**	-0.675**	-.088
Body weight (kg)	0.804**	0.872**	-0.731**	-	0.103	0.290	-0.363	-

** indicates significant correlation

increase significantly in older or heavier dogs of the same breed, thereby explaining the poor correlations in the case of adults. However, as per our data, aortic luminal diameter increases with age even in adults. Although no explanatory scientific basis for this is found in the literature, it could be related to the hypertensive nature of hounds (Sangwan et al. 2023), explaining the mild negative correlation between age and KL:Ao (Fig. 4).

The linear multi variate regression equations KL=45.5+0.92 (BW) – 0.02 (age); KL:Ao=10.58–0.1 (BW) – 0.035 (age) expressing KL and KL:Ao, as a function of age and body weight, is suggestive that the latter has a strong influence. Since the adults of a breed often weigh within a breed specific range for most of their lifetime, a breed specific reference interval for Kl and KL:Ao is suitable for quick reference. These equations can be used in other sighthounds with similar physique.

Conclusion

A narrow, breed specific KL:Ao reference interval for Chippiparai was obtained. The findings of this study indicate that age and body weight influence KL:Ao. Targeted studies within canine groups of similar morphological features would narrow the range and enhance its accuracy, as attempted in the present study.

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