A SCREENING PROGRAM FOR SUBAORTIC AND PULMONIC STENOSIS IN THE ITALIAN BOXER DOG POPULATION: PREVALENCE AND PRELIMINARY ANALYSIS

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AIMS

- ✓ **to asses the prevalence of subaortic and pulmonic stenosis in the Italian Boxer dog population**
- ✓ **to investigate variation of morphometric and dynamic measurements collected through echocardiography**
- ✓ **to perform a risk analysis of heart defects through logistic regression**
- ✓ **to estimate heritability of echocardiographic traits**

SUBARTIC STENOSIS (SAS)

- most common congenital cardiac malformation in large breed dogs
- fibrous ring of tissue immediately below the aortic valve
- breeds at increased risk: Newfoundland, Boxer, Rottweiler, Golden Retriever, German Shepherd
- exertional tiring, syncope, left-sided congestive heart failure, sudden death without premonitory signs in severely affected dogs

Figure 1. SAS (Doppler)

PULMONIC STENOSIS (PS)

- one of the three most common congenital heart defects occurring in dogs
- narrowing between the right ventricular outflow tract and the main pulmonary artery
- breeds at increased risk: Beagle, Samoyed, English Bulldog, Miniature Schnauzer, Cocker Spaniel, Boykin Spaniel, Labrador Retriever, Mastiff, Chow-chow, Newfoundland, Basset Hound
- evidence of genetic basis for Beagle and Keeshond
- exertional fatigue and syncope in young severely affected dogs, signs of congestive right heart failure in old severely affected ones

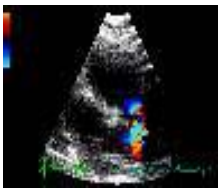

Figure 2. PS (Color Doppler)

MATERIALS and METHODS

✓1,138 randomly chosen Italian Boxer dogs (52.5% females) screened through echocardiography by 6 veterinarians

✓risk of SAS or PS investigated by a LOGISTIC REGRESSION model including morphometric and dynamic echocardiographic measurements and murmur grade

✓morphometric and dynamic measurements from echocardiography analyzed by ANOVA

✓estimation of variance components and heritability using univariate animal models and REML procedures (VCE 4 package)

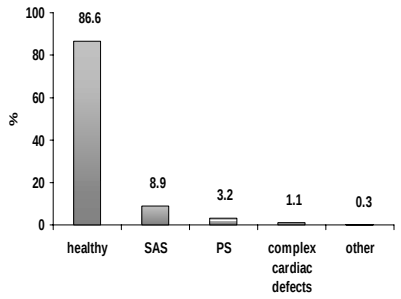

Figure 3. Frequency of cardiac defects in the sample

CONCLUSIONS

- ✓**the Italian Boxer dog population shows a moderate SAS and a low PS prevalence**
- ✓**the variation of echocardiographic measurements is greatly influenced by the veterinarian effect**
- ✓**murmur grade and peak velocities are risk factors for both SAS and PS occurrence whereas the orifice diameter is a relevant risk factor only for SAS occurrence**
- ✓**the moderate heritability estimates evidence the role of genetic effects in affecting variation of morphometric and dynamic traits**
- ✓**further studies are necessary to investigate the mode of inheritance of these traits**

Trait	Mean	SD	Min	Max
body weight (kg)	30.08	4.77	18	50
aortic orifice diameter (mm)	17.44	1.97	7.9	24.1
pulmonary orifice diameter (mm)	17.46	2.19	10	26.6
aortic peak velocity (m/s)	2.11	0.67	0.78	7.11
pulmonary peak velocity (m/s)	1.45	0.47	0.73	6.04
aortic peak gradient (mmHg)	19.82	19.24	1.35	202.2
pulmonary peak gradient (mmHg)	9.49	9.57	1.14	145

Table 1. Descriptive statistics of echocardiographic traits

Trait	h^2 (%)	σ_a	SE
aortic orifice diameter (mm)	30	0.86	0.061
pulmonary orifice diameter (mm)	33	1.033	0.062
aortic peak velocity (m/s)	28	0.322	0.057
pulmonary peak velocity (m/s)	22	0.226	0.061
aortic peak gradient (mmHg)	27	8.660	0.061
pulmonary peak gradient (mmHg)	18	4.182	0.058

Table 2. Heritability estimates of echocardiographic traits

RESULTS

✓ prevalence of SAS and PS was 8.9 and 3.2%, respectively (Figure 3), and prevalence of PS for males was higher than that for females

✓body weight and veterinarian performing the echocardiography were significant sources of variation of echocardiographic morphometric traits (R^2 = 15 - 41%; P < 0.01)

✓veterinarian significantly affected the variation of dynamic measurements (R^2 = 1 - 5%; P < 0.01)

✓cardiac murmur grade was the most important risk factor for stenosis, and the probability of stenosis occurrence greatly increased at increasing murmur grade

✓aortic peak velocity and aortic orifice diameter were related with cardiac diseases occurrence (P < 0.05), and dogs with higher peak velocity and narrower aortic orifice were more likely affected by SAS

✓another risk factor for PS was the pulmonic peak velocity (P < 0.05): a greater peak velocity increased the probability of positive PS diagnosis

✓estimates of heritability for the main echocardiographic traits ranged between 18 and 33% (Table 2)

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