

AORTIC STENOSIS IN DOGS: CLINICAL CHARACTERISTICS AND SURVIVAL IN 80 CASES

Aleksandra Domanjko Petrič*, Sanja Cvetko

Clinic for Surgery and Small Animal Medicine, Veterinary Faculty, University of Ljubljana, Cesta v Mestni log 47, 1000 Ljubljana, Slovenia

*Corresponding author, E-mail: aleksandra.domanjko@vf.uni-lj.si

Summary: Eighty cases of dogs with aortic stenosis (AS) examined at the University Small Animal Clinic in Ljubljana, Slovenia between 2002 and 2007 were analysed. Our focus was on breed predisposition, natural course of the disease and survival of dogs with different grades of AS. German Boxer was the most common breed (56 dogs), followed by 8 Golden Retrievers, 3 Newfoundlands and 2 German Shepherds. Eleven breeds had only one representative. The genders were equally represented. Syncope occurred in 22% of dogs with mild AS, 20% of those with moderate AS and 37% of those with severe AS; in the last group, syncope occurred more frequently. Heart failure was a rare consequence of AS alone (4%) – most dogs with heart failure had a concurrent cardiac disorder. Fifty-one dogs had mild, 10 had moderate and 19 had severe AS. Most of the dogs had a subvalvular type of AS (94%). A positive correlation was found between murmur intensity and AS pressure gradient. A negative correlation was found between murmur intensity, left ventricular systolic diameter and survival days, and between AS pressure gradient and aortic root diameter. Pulmonic stenosis was the most common concurrent diagnosis (35% of dogs). Average survival for all dogs ($n=55$) was 2053 ± 1198 days (range 312–4619 days) and no significant differences in survival were found between groups. 29% of dogs died by the end of the study, in the severe group mostly as a consequence of AS, and in the other groups because of concurrent cardiac or noncardiac diseases. 38% of dogs with severe AS lived as long as dogs from the other two groups. A good screening program is essential for lowering the incidence of aortic stenosis.

Key word: dog diseases – congenital; heart diseases – congenital; aortic stenosis, subvalvular – ultrasonography; echocardiography; dogs

Introduction

Aortic stenosis (AS) has become the most common congenital heart disorder in dogs, and, over the past 10 years, German Boxers have proved to be the most sensitive breed (1–5). The subvalvular form – subaortic stenosis (SAS) – has been reported as that most frequently seen (in 95%) (6, 7). Aortic stenosis has been graded as ‘mild’, with pressure gradients (PG) either from 16 to 40 mmHg (corresponding to aortic velocities, v , of 2.3–3.2 m/sec) or from 20 to 49 mmHg (corresponding to velocities of 2.25–3.5 m/sec, ‘moderate’, with PG either from 40 to 80 mmHg ($v=3.2$ –4.4 m/sec) or 50 to 80 mmHg ($v=3.5$ –

4.5 m/sec) and ‘severe’ with PG above 80 mmHg, corresponding to velocities over 4.5 m/sec (8, 9).

Clinical signs such as weakness, syncope and sudden death are more commonly seen in dogs with severe or moderate AS than in those with mild SAS (6, 7, 8). Dogs with mild AS rarely show any signs at all (6). Those with severe AS have a shorter life expectancy than dogs with mild AS, and often die suddenly in the first three years of life (7, 8). Careful physical examination reveals crescendo-decrescendo systolic murmur from grades 1 to 6. Final diagnosis has to be confirmed by two-dimensional and Doppler echocardiography, by which evaluation of morphologic characteristics the type of stenosis and the pressure gradient across the stenosis can be assessed (7, 8, 9). Standard or 24-hour electrocardiography can be used to detect arrhythmias that

can occur in moderate or severe stenosis (6, 11). On thoracic radiographs a post-stenotic aortic dilation can be visible when present or when signs of heart failure are appreciable, especially when AS is complicated by another congenital or acquired heart disease. In this study aortic stenosis was analysed retrospectively to determine the prevalence in individual breeds, the natural course of the disease, the prevalent type of the disease, the frequency of the different grades of AS and correlations between murmurs and grades of AS. Survival was calculated for the groups of AS.

Material and methods

The study was carried out at the Clinic for Surgery and Small Animal Medicine, Veterinary Faculty of Ljubljana, Slovenia. Retrospective research included cases with AS between years 2002 and 2007. Information about health and survival was obtained from owners by phone interview with a standard questionnaire: "Is the dog active while taking walks? Does it run or only walk? Is it getting tired after physical exercise? Has it ever had syncope/fainting or weakness? If yes, when and at what occasion did syncope occur? Is the dog on any medication and/or have any concurrent disease?" Remaining information was taken from medical records and the cardiac service data base. All dogs had 9 lead ECG recorded in right recumbence, and thoracic radiographs were taken as needed. Echocardiography, including Doppler study, was performed with GE Vigmed System Five on unsedated dogs in standard right and left views. (12) Aortic velocity was measured from the left apical view with a continuous Doppler imaging probe of 1.7-3.5 MHz. (13) In many dogs a subcostal view with the same probe was used. Aortic stenosis was graded according to the latest recommendations on the basis of aortic velocity measured in the left apical view (9). Dogs were classified in the following groups: mild AS with gradients 20–49 mmHg ($v = 2.25\text{--}3.5$ m/sec), moderate AS with gradients 50–79 mmHg ($v = 3.5\text{--}4.5$ m/sec) and severe AS with gradients over 80 mmHg ($v > 4.5$ m/sec).

Statistical analysis made use of SPSS 15.0 and Kaplan-Meier survival curves were obtained with MATLAB 7.5.0 software. Pearson correlation coefficients were calculated between echocardiographic parameters, murmur grade and survival. Differences in survival between the three groups of AS were calculated with independent sample T test; P values < 0.05 were considered significant.

Results

Eighty-seven dogs were diagnosed with AS between 2002 and 2007. Seven dogs from this group were not included because of possible flow murmurs or borderline aortic velocities with turbulent blood flow in the left ventricular outflow tract (LVOT) ($v \leq 2.22$ m/sec ($n=4$)) or dynamic AS ($n=3$) caused by anterior mitral valve motion (2) and thickened interventricular septum due to pulmonic stenosis (1). The 80 dogs comprised 56 German Boxers, 8 Golden Retrievers, 3 Newfoundlands, 2 German Shepherds, and 11 other breeds with only one representative each (Table 1). Affected dogs were equally distributed according to gender; 41 were males and 39 females. The median age at diagnosis was 1.6 years (range 0.17-10.25 years). Thirteen dogs were 6 months old or less at the time of examination, (the youngest was 2.4 months). Thirty-seven dogs (46%) were diagnosed at less than 1.5 years, 11 (14%) between 1.5 and 3.5 years, 17 (21%) between 3.5 and 6.5 years and the remainder ($n=15$; 19%) at more than 6.5 years. Of those 24 dogs that were examined at 1 year or less, 13 dogs had mild AS, four had moderate stenosis and 7 had severe disease. Only 5 of those dogs examined at one year or less, and ten dogs older at diagnosis were re-examined later. All the dogs had systolic crescendo-decrescendo murmur. The frequencies of murmur grades were: 1 dog (1%) with 1/6 murmur, 20 (25%) with 2/6 murmur, 28 (35%) with 3/6 murmur, 20 (25%) with 4/6 and 2 (3%) with grade 5/6 murmur. No murmur grade was specified in 9 dogs (11%) (Figure 1).

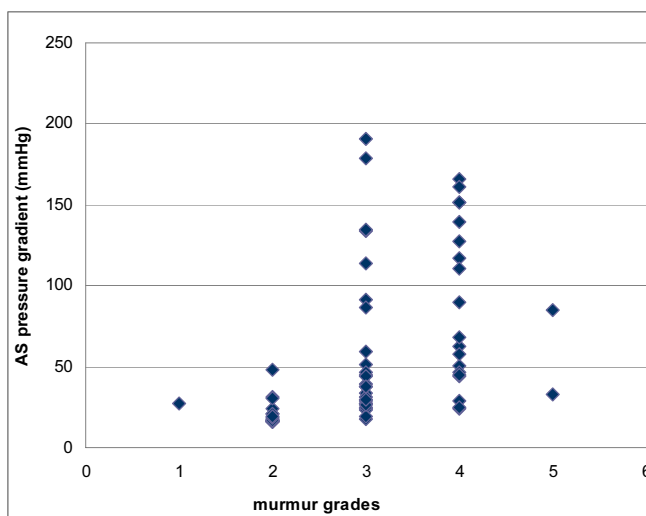


Figure 1: Murmur grades in relation to the pressure gradients

Table 1: Breeds presented with AS and concurrent cardiac disorders

breed	no. patients with AS	concurrent cardiac disorders
German Boxer	56	PS, AI, MD, TD, MR, TR
Golden retriever	8	PS, AI,
New Foundland	3	PS, AI, MR
German Shepherd	2	AI
Alaskan Malamute	1	neoplasia in right atrium
American Staffordshire Terrier	1	/
Bernese Mountain dog	1	AI, MR
French Bulldog	1	VSD, AI
Irish Setter	1	AI
Parson Russell Terrier	1	/
Labrador Retriever	1	PS, AI
Pug	1	AI
Rottweiler	1	PS
Samoyed	1	/
West Highland Terrier	1	PS, VSD

Legend: PS – pulmonic stenosis, AI – aortic insufficiency, MR – mitral regurgitation, TR – tricuspid regurgitation, MD – mitral dysplasia, TD – tricuspid dysplasia, VSD – ventricular septal defect

Seventy-five dogs (94%) had subvalvular AS and 5 (6%) valvular AS. Fifty-one dogs had mild AS, 10 had moderate AS and 19 had severe AS.

Syncope, or episodic weakness, occurred in 11/51 dogs (22%) with mild AS, 2/10 (20%) with moderate AS and 7/19 (37%) in the severe group. Syncope occurred more often in the severe group. In the group of dogs with syncope and mild AS, 2 dogs had additionally mild PS and one had tricuspid dysplasia with CHF (ISACHC II). It has to be pointed out that only in the 5 dogs with mild stenosis did syncope/episodic weakness occur before the diagnosis while, in the remainder, (6) syncope occurred some time later (information obtained from the phone interview). Syncope was defined as a transitional loss of consciousness or episodic weakness. One dog with moderate AS and syncope had additionally severe PS. Dogs with severe AS and syncope had no concurrent diseases; one of them was in CHF (ISACHC II). Congestive heart failure is a rare complication in dogs with AS. In our research there were eight such dogs that had concurrent cardiac problems such as mitral (n=4) and tricuspid regurgitation (n=1), tricuspid (n=1) and mitral dysplasia (n=1), ventricular septal defect (n=1), myxomatous mitral degeneration (n=1) and PS (n=2). Two dogs developed myocardial failure.

Table 2: Correlation coefficients (r) between murmur grade and various variables and aortic stenosis pressure gradient (ASp) and various variables

variables		r	P
murmur grade	ASp	0,388	<0,001
	IVSs	0,254	0,034
	LVDs	-0,354	0,003
	ASv	0,414	<0,001
	DT MVE	0,365	0,015
	survival	-0,284	<0,001
	PSp	0,566	0,001
	PSv	0,618	<0,001
ASp	AOd	-0,276	0,05
	PVs	0,609	0,004
	IVSs	0,412	<0,001
	IVSd	0,384	0,001
	survival	-0,041	0,703
	LVPWd	0,538	<0,001
	LVPWs	0,368	0,001

Legend: ASp – aortic stenosis pressure gradient, IVS – interventricular septum in systole, LVDs – left ventricular dimension in systole, ASv – aortic stenosis velocity, DT MVE – deceleration time of the mitral E wave, PSp – pulmonic stenosis pressure gradient, PSv – pulmonic stenosis velocity, AOd – aortic diameter, PVs – pulmonic vein systolic velocity, IVSd – interventricular septum in diastole, LVPWd – left ventricular posterior wall in diastole, LVPWs – left ventricular posterior wall in systole

Correlation coefficients between echocardiographic parameters, grade of murmur and survival are listed in Table 2. Murmur intensity and AS pressure gradient were significantly correlated ($r=0.388$; $P<0.001$), as were murmur intensity and PS pressure gradient ($r=0.566$; $P=0.001$). Murmur intensity was negatively correlated with left ventricular diameter in systole ($r=-0.354$; $P=0.003$) and with survival days ($r=-0.284$; $P<0.001$). Negative correlations were observed between aortic diameter and AS pressure gradient (PG) ($r=-0.276$, $P=0.050$), and between AS PG and survival ($r=-0.041$, $P=0.703$). Positive correlations existed between AS pressure gradient and interventricular septum diameter in systole ($r=0.412$; $P<0.001$) and in diastole ($r=0.384$; $P=0.001$), AS pressure gradient and left ventricular posterior wall diameter in systole ($r=0.368$; $P=0.001$) and diastole ($r=0.538$; $P<0.001$) were correlated. Pulmonic stenosis was the most frequently concurrently diagnosed cardiac disease ($n=28$; 35%) with AS.

Eight dogs (10%) received pharmacological therapy, two of them with moderate AS and 6 with severe AS. The dosage of atenolol ranged from 0.46 to 1.62 mg/kg/12h. Since these dogs did not come to a re-check we cannot report on the pharmacological effect on the PG.

Arrhythmias were observed in 17 dogs (21%) with AS. Ventricular premature contractions, left bundle branch block and supraventricular tachycardia were seen in 5 dogs, atrial fibrillation in 4 dogs, atrial premature contractions in 2 dogs, and sinus bradycardia and ventricular preexcitation in one dog. Five dogs had more than single arrhythmia. Six dogs with arrhythmias were in congestive heart failure (ISACHC II and III).

Survival was calculated for the 55 dogs whose data were available. Mean survival of the whole group was 2053 ± 1198 days (range 312–4619 days, median 2030 days or 72 months). Survival for the mild, moderate and severe AS groups did not differ significantly (Table 3, Figure 2).

23 dogs (28.8%) with AS died during our research. 12 died suddenly and 11 were euthanized. Of those that died suddenly 3 dogs had mild AS, 2 had moderate AS and 7 had severe AS. Dogs with mild AS had other cardiac diseases as follows: one dog had mild PS, one had severe tricuspid dysplasia with mild PS, one had severe PS and one had severe aortic insufficiency. One dog with moderate AS also had a mast cell tumour. Sudden death was defined as being when the owner witnessed or reported unexplained sudden death, but it has to be noted that

Table 3: Survival days (mean and standard deviation) in different groups with aortic stenosis P value is calculated between individual groups

Group	No. dogs	Survival days	P value
1	35	2078 ± 1158	0.287
3	13	1933 ± 1299	
2	7	2148 ± 1372	0.739
3	13	1933 ± 1299	
1	35	2078 ± 1158	0.271
2	7	2148 ± 1372	

Legend: 1 – mild AS; 2 – moderate AS; 3 – severe AS

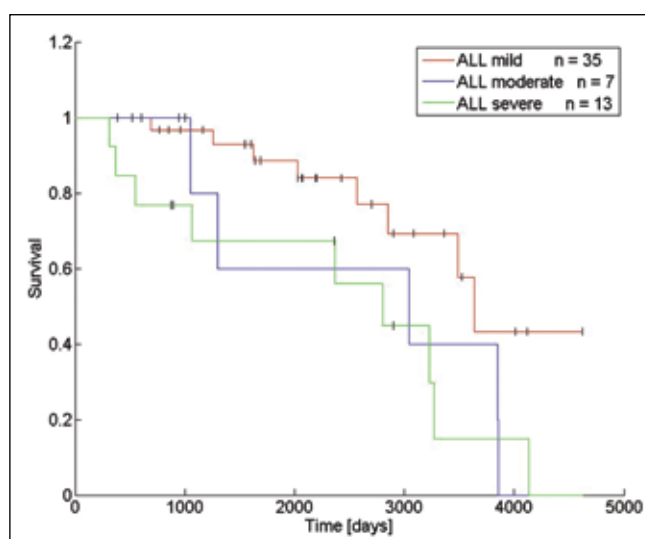


Figure 2: Comparison between survival of dogs with mild, moderate and severe aortic stenosis

it was not confirmed to be cardiac. Four dogs that were euthanized had concurrent non-cardiac disease (chronic renal failure, chronic hyperplastic gastritis, tetanus and neoplasia). Fifty-five dogs were included in graphical analysis of survival days. German Boxers, the most frequent breed ($n=37$) with AS, died on average earlier in the first 2.7 years than other breeds. Comparison between mild, moderate and severe AS showed surprisingly long survival of some dogs with moderate and severe disease, even 8 years or more. (Figure 2) Thirty-eight percent of dogs ($n=5$) with severe AS lived as long as dogs from the other two groups.

Discussion

Aortic stenosis is the most common congenital heart defect in dogs in the last decade, both generally and in dogs in Slovenia (1,2,3,4,5). The popula-

tion of dogs included in our research showed similar numbers of cases as in other countries in the same period (1-3,5). The most affected breed in this study was German Boxer ($n=56$), as in Italy and France (1,5). The reason for the high prevalence of AS in that breed in Slovenia could be its popularity in recent years and the facts that they are bred in a relatively small area and without obligatory screening for breeding. Golden Retrievers were the second most common breed ($n=8$) and are known to be highly predisposed (2, 6, 7). No gender predisposition was found in our study, as cited by some authors (2) but not others (1,8).

The most often heard murmurs were systolic crescendo-decrescendo grades 2/6 to 4/6. Murmur grade correlated weakly positively with AS and PS pressure gradient ($P<0.001$) in our study, while stronger positive correlations have been found by others (14).

Most dogs with mild AS are asymptomatic (8). Symptoms usually occur in dogs with moderate and severe AS (10). In our research 21.6% (11 dogs) with mild AS were symptomatic with one syncope or episodic weakness observed. 4 of those had syncope more than once. It has to be stressed that only in 5 dogs with mild AS did syncope occur before diagnosis and in 6 dogs syncope occurred later, according to the interview. That would indicate that these dogs might develop more severe disease while maturing. This is supported by findings from a British study that confirmed that AS is a developmental disease and can worsen by the time dogs mature. (15) Only one of the dogs in the mild AS group with syncope had concurrent tricuspid dysplasia and congestive heart failure. Others had concurrent mild PS or no cardiac/non-cardiac disease. Syncope is rare in dogs with mild stenosis, but it can occur also from non-cardiac causes, especially in brachycephalic breeds, so syncope in some mild AS dogs might be unrelated to AS. In the group with moderate AS, 2/7 dogs were symptomatic, with syncope or episodic weakness. In the severe group 7/19 (36%) were symptomatic: six dogs had syncope monthly with marked tiredness and extreme fatigue; 1 dog had syncope only once.

Congestive heart failure is a rare complication of AS (6, 7, 8, 10, 11). It is due mainly to coexisting mitral insufficiency or to concurrent cardiac defect. In our study 8 dogs (10%) had congestive heart failure (CHF). All our dogs with CHF had a concurrent problem such as mitral and tricuspid regurgitation, mitral and tricuspid dysplasia, ventricular septal

defect, myxomatous mitral degeneration, pulmonic stenosis and/or myocardial failure. Mitral regurgitation, a consequence of ventricular remodelling and myocardial failure, can occur in late stages of moderate and severe SAS (6, 16) and was seen in 6 of our patients. Only 3 patients (3.7%) in CHF had no concurrent congenital heart defect, indicating that the true prevalence of heart failure in AS is low. In all other dogs, heart failure was more probably due to concurrent cardiac disorders.

The distribution of dogs according to the grade of AS was similar in our study to that reported (8), with 63% of dogs with mild AS, 12% with moderate AS and 23% with severe AS. Subvalvular AS (94%) was the most common form in our study, similar to that reported (1, 6, 7, 8, 10, 11). The valvular form is less common – in our dogs it occurred in 6 % of cases. It is characterised by a thickened valve with an abnormal motion of valve leaflets. Thickened aortic valve can also be seen in subaortic stenosis because of the damage caused by a high velocity jet across the orifice. (6, 15)

A positive correlation between murmur intensity and aortic velocity was found also by Linde et al et al. (14) A positive correlation between murmur intensity and deceleration time of the mitral valve can be explained by the slow closure of the early mitral valve opening that occurs in AS. Longer DT of the mitral E wave in Boxers with AS was also observed by Schober and Luis Fuentes (17). The negative correlation between murmur intensity and left ventricular diameter in systole can be explained by smaller LV diameter in AS, due to thickening of the LV walls. The negative correlation of pressure gradient with aortic diameter is understandable because of the smaller orifice in more severe cases. (18) Pressure gradient correlated positively with interventricular septum thickness in systole and diastole, and with left ventricular posterior wall diameter in systole and diastole, which is a logical result of left ventricular hypertrophy in dogs with AS. (6, 18) All correlations in our study were low and clinically significant inferences cannot be made.

Pulmonic stenosis was present in 35% of dogs with AS within this group. This proportion was 79% in German Boxers, the most common breed. A similar incidence was found in Italy, where 38% had concurrent PS (22). Much lower PS incidence in dogs with AS was found by Kienle et al (8), probably because of lower incidence of Boxers in that group.

Arrhythmias were diagnosed only in 17 dogs (21%), almost half of them in CHF. Ventricular pre-

mature complexes were present only in 5 dogs (6%). Detection of low proportions of arrhythmias were also found by Linde and Koch (14) and were observed only in the severe AS group. An event recorder would be more suitable to detect irregularities in heart rhythm.

The median age at diagnosis was 1.6 years, although more than half of the dogs were diagnosed before 2 years of age, usually at vaccination. Kienle et al. similarly found that 69 % of dogs were diagnosed before 1 year. (8) A wide age range at the time of diagnosis has been reported by other authors, possibly due to lack of symptoms (7, 8,10). The survival curve of dogs with severe AS is steeper in the first 2 years, when 50% of the dogs died. A similar finding was reported by Kienle et al. (8). Surprisingly, some of the dogs with moderate or severe AS lived 8 years or more. Individual older dogs in the severe AS group have also been reported by other authors (7, 8) Median survival for all our groups of dogs together was longer than in the study of Kienle et al. (72 vs. 40.5 months) (8). The reason could be that they were referred more severely affected dogs, that succumb sooner. Also some of our dogs in the severe AS group received beta blockers whereas their group contained only untreated dogs.

Conclusion

Aortic stenosis is common in German Boxers in Slovenia. Other breeds that are also affected are Golden Retriever (10%), Newfoundland (4%) and German shepherd (3%). Forty-six percent of patients were diagnosed at the age of 1.5 years or less. Pulmonic stenosis was the most common concurrent cardiac disease (35%). Fifty percent of dogs with severe AS died in the first three years after diagnosis, although some dogs with severe AS lived as long as dogs with mild AS.

A good breeding program is essential to lower the incidence of AS.

Limitations of the study

The first limitation of this study is its retrospective nature; most of the data were pooled from the records, in spite of the fact that all the owners were contacted when gathering the data for the study. In some records, the circumstances in which dogs had syncope or died suddenly were not described in detail. None of these dogs had a Holter monitor, so we cannot exclude some other cause for syncope such

as right arrhythmogenic cardiomyopathy or dilated cardiomyopathy in boxers.

Acknowledgements

The authors thank Žiga Valentič for his help with calculating survival curves.

References

1. Bussadori C, Domenech O, Pradelli D. Canine subaortic stenosis -pathoanatomical observations in Italian Boxers. In: Proceedings of the 7th FECAVA Congress. Berlin, 2001: 16-8.
2. Tidholm A. Retrospective study of congenital heart defects in 151 dogs. *J Small Anim Pract* 1997; 38: 94-8.
3. Baumgartner C, Glaus TM. Congenital cardiac diseases in dogs: a retrospective analysis. *Schweiz Arch Tierheilkd*. 2003;145: 527-36.
4. Domanjko Petric A, Hozjan E. Epidemiological study of cardiovascular diseases in Slovenia. In: Proceedings of the 14th European College of Veterinary Internal Medicine. Barcelona, 2007: 212.
5. Le Bobinnec G. Canine Subaortic stenosis: epidemiology in France, ECG changes, antiarrhythmic drug therapy. In: Proceedings of the 7th FECAVA Congress. Berlin, 2001: 12-5.
6. Kienle RD. Aortic stenosis. In: Kittleson MD, Kienle RD, eds. *Small animal cardiovascular medicine*. St Louis: Mosby, 1998: 260-72.
7. O'Grady MR, Holmberg DL, Miller CW, et al. Canine congenital aortic stenosis: a review of the literature and commentary. *Can Vet J* 1989; 30: 811.
8. Kienle RD, Thomas WP, Pion PD. The natural clinical history of canine congenital subaortic stenosis. *J Vet Intern Med* 1994; 8(6): 423-31.
9. Bussadori C, Amberger C, Le Bobinnec G, et al. Guidelines for the echocardiographic studies of suspected subaortic stenosis. *J Vet Cardiol* 2000; 2: 15-22.
10. Fuentes LV. Aortic stenosis in boxers. *Vet Annu* 1993; 33: 220-9.
11. Oyama MA, Sisson DD, Thomas WP, Bonagura JD. Congenital heart disease. In: Ettinger SJ, Feldman EC, eds. *Textbook of small animal internal medicine*. 6th ed. Philadelphia: WB Saunders, 2005: 972-1021.
12. Thomas WP, Kienle RD. Echocardiography. In: Nyland TG, Mattoon JS. *Small animal diagnostic ultrasound*. Philadelphia: W.B. Saunders company, 1995: 384-7.

13. Darke PGG, Bonagura JD, Miller M. Transducer orientation for Doppler echocardiography in dogs. *J Small Anim Pract* 1993; 34 :2 – 8
14. Linde A, Koch J. Screening for aortic stenosis in the Boxer: auscultatory, ECG, blood pressure and Doppler echocardiographic findings. *J Vet Cardiol* 2006; 8: 79–86.
15. French A, Fuentes VL, Dukes-McEwan J, et al. Progression of aortic stenosis in the Boxer. *J Small Anim Pract* 2000; 41: 451–6.
16. Opie LH, Commeford PJ, Gersh BJ, Pfeffer MA. Controversies in ventricular remodelling. *Lancet* 2006; 367(9507): 356–67.
17. Schober KE, Fuentes VL. Doppler echocardiographic assessment of left ventricular diastolic function in 74 Boxer dogs with aortic stenosis. *J Vet Cardiol* 2002; 4: 7–16.
18. Oyama MA, Thomas WP. Two dimensional and M-mode echocardiographic predictors of disease severity in dogs with congenital subaortic stenosis. *J Am Anim Hosp Assoc* 2002; 38 (3): 209–15.
19. Bussadori C, Quintavalla C, Capelli A. Prevalence of congenital heart disease in Boxers in Italy. *J Vet Cardiol* 2001; 3: 7–11.

AORTNA STENOZA PRI PSIH

A. Domanjko Petrič, S. Cvetko

Povzetek: Med letoma 2002 in 2007 smo diagnosticirali 80 pacientov z aortno stenozo (AS) na Univerzitetni Kliniki za kirurgijo in male živali v Ljubljani. Zanimala nas je pasemska nagnjenost k AS, naravni potek bolezni in preživetje psov z različnimi stopnjami AS. Nemški bokserji so bili najpogostejše zastopana pasma, sledilo jim je 8 zlatih prinašalcev, 3 novofundlandci in 2 nemška ovčarja. 11 pasem pa je imelo le po enega predstavnika. Spola psov sta bila enakovredno zastopana. Sinkope so se pojavile pri 22 % psov z blago AS, 20 % psov s srednjo AS in 37 % psov s hudo AS. Pri psih v slednji skupini so se sinkope pojavljale pogostejše. Popuščanje srca je redek zaplet pri samo AS (4 %); večina psov s srčnim popuščanjem je imela poleg AS še eno srčno okvaro. Enainpetdeset psov je imelo blago, 10 srednjo in 19 hudo AS. Večina psov je imela subvalvularni tip AS (94 %). Stopnja šuma je značilno pozitivno korelirala s tlačnimi gradienti AS in pljučno stenozo (PS), medtem ko je značilno negativno korelirala s premerom levega prekata v sistoli in s preživetjem. Tlačni gradient AS pa je bil v negativni povezavi z premerom korena aorte. Pljučna stenoza je bila najpogostejša sočasna diagnoza z aortno stenozo (35 %). Psi z AS ($n = 55$) so živeli povprečno 2053 ± 1198 dni (razpon od 312 do 4619 dni). Med skupinami psov z AS ni bilo značilnih razlik glede preživetja. Do konca raziskave je poginilo 29 % psov, v skupini s hudo AS najpogostejše zaradi le-te, v drugih skupinah pa zaradi drugih srčnih ali nesrčnih bolezni. 38 % psov s hudo obliko AS je živelo tako dolgo kot psi iz ostalih dveh skupin.

Dober vzrejni program je nujen za zmanjšanje pojavnosti aortne stenoze.

Ključne besede: psi, bolezni – prirojene; srce, bolezni – prirojene; aortna stenoza, subvalvularna – ultrazvok; ehokardiografija; psi