

STUDIES ON M-MODE ECHOCARDIOGRAPHIC PARAMETERS IN HEALTHY GERMAN SHEPHERD DOGS

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M-Mode echocardiographic parameters were studied in twenty apparently healthy German shepherd dogs (10 males and 10 females) of above 1.5 years of age. Following parameters were recorded : right ventricular diameter in diastole (RVDd), interventricular septum in diastole (IVSd), interventricular septum in systole (IVSs), left Ventricular diameter in diastole (LVDd), left ventricular diameter in systole (LVDs), posterior wall in diastole (PWd), posterior wall in systole (PWS), ejection fraction (EF), fractional shortening (FS), left atrium (LA), aorta (Ao), left atrium to aorta ratio (LA/Ao), left ventricular mass (LVM) and end-point to septal separation (EPSS). There was no statistically significant difference between echocardiographic parameters of male and female at $p \leq 0.05$ except systolic and diastolic M-mode parameters. There was also weak correlation of LA dimension with body weight (BW) and body surface area (BSA) in males which was 0.61 and 0.60 respectively and LVDs in females 0.61 each.

Keywords: Echocardiography, German shepherd dog, M-mode..

Dogs and humans share a special bond. They have become an integral part of a family and have a significant impact and role in human lives. German shepherds are more popular working dogs world wide. Cardiac diseases are one of the most important diseases being detected frequently in working dogs.

Echocardiography is the non-invasive and nonionizing real time visualization of cardiac structure, mechanical activity and blood velocities through different valves in the heart. Echocardiography has become an indispensable tool in the specialty practice of veterinary cardiology (Kienle and Thomas 2002) and has been adopted widely and is used extensively to achieve definitive diagnosis of most cardiac diseases. M-mode echocardiography enables examiner to evaluate the cardiac chamber size, wall thickness and different stages of cardiac cycle and thus enabling him to evaluate structure and function of heart.

Due to large variations in body weight and sizes observed in dogs, establishment of reference ranges for every breed under agroclimatic condition is necessary which may be added values for clinicians and research workers.

Materials and Methods

Twenty apparently healthy German shepherd dogs of both sexes (10 males and 10 females), aged from 2 to 8 years were included in study after subjecting them to the complete physical and clinical examination followed by x-ray of chest (Left lateral), electrocardiogram (ECG) and haemato-biochemistry (CBC, LFT, KFT and Serum electrolytes). An ultrasound unit MyLab40VET, phased array Cardiac Probe PA230 with 3.0 to 5.5 MHz frequency was used for M-mode echocardiographic examination. No anaesthesia or sedation was given to any of the dog in this study. After clipping of the hairs on right thoracic wall, dogs were placed in right lateral recumbency on a specially designed wooden table with a cut-out hole. The right precordial thrill was palpated by fingers. Ultrasonic gel was used for coupling the transducer with the skin. The transducer was placed through a hole from underneath the table, to a right parasternal position, usually intercostal spaces 3-5. The M-mode echocardiographic examination was systematically performed beginning with 2-D echocardiography followed by M-mode to receive maximal diagnostic information. A simultaneous ECG was recorded to assist in timing the flow signal with cardiac cycle. Three M-Mode echocardiographic views were recorded viz. 1. Right parasternal long

axis view just behind the AV valves, 2. At the tip of the Mitral valve and 3. At right parasternal short axis view at the level of the aorta.

1. Long axis measurements:

Measurements were performed on right parasternal long axis four chamber view, placing the M-mode cursor line just below the tips of the mitral valve as follows: right ventricular diameter in diastole (RVDd), left ventricular diameter in diastole (LVDd), left ventricular diameter in systole (LVDs), inter ventricular septum in diastole (IVSd), inter ventricular septum in systole (IVSs), posterior wall in diastole (PWd), posterior wall in systole (PWs), ejection fraction (EF), fractional shortening (FS) and left ventricular mass (LVM).

2. E - Point to Septal Separation (EPSS):

It was measured on the M-mode echocardiogram using long axis view at the level of Mitral valve. A distance between E point of mitral valve excursion to the interventricular septum was measured.

3. Short axis measurements:

Right parasternal short axis view was obtained at the level of the aortic valve and parameters were measured viz., early diastolic left atrial diameter (LA), Early-diastolic cross-sectional aortic diameter (Ao) and Left atrium / Aorta (LA/Ao).

All M-mode echocardiographic measurements were performed on three consecutive cardiac cycles and their averages were used for statistical analysis. Correlation

coefficient was applied to assess the relation of each M-mode echocardiographic parameters and left ventricular systolic time intervals with body weight and body surface area. Student 't' test was used to determine the effect of gender on M-mode echocardiographic parameters.

Results and Discussion

Table-1, depicts the findings of M-mode echocardiographic study in healthy German shepherded dogs. Echocardiographic parameters viz. RVDd, IVSd, LVDd, PWd, IVSs, LVDs, PWs, EF, FS, LVM, EPSS, LA, AO and LA/AO were compared between sexes and there was no statistically significant difference between echocardiographic parameters of male and female at $p \leq 0.05$ while statistically significant difference was observed between systolic and diastolic observation in both male and female. Analysis of correlation depicts weak correlation of LA dimension with BW and BSA (0.61 and 0.60 respectively) in male and LVDs in females (0.61 each). Observations were in agreement with Muzzi *et al.* (2006), except RVDd, LVDd, LVDs, LVM values which were highly correlated with the body weight. Further observations are in agreement with Kayar *et al.* (2006) except LA dimension in male and LVDs in female. German shepherd breed specific data was generated for male and female dogs under Indian condition which may be used as reference range for further studies and interpretation of echocardiographic examinations by the veterinarians.

Table-1. Comparison of M-Mode echocardiographic parameters between male and female German Shepherd dogs

Sr. No	Parameter	Overall / Range (n=20)	Males / Range (n=10)	Females / Range (n=10)	t calculate d	t table
1	BW(kg)	34.10 ± 0.98 / 25 - 40	33.70 ± 1.43 / 25 - 40	34.44 ± 1.48 / 27 - 40	0.69 ^{NS}	2.10 at 5%
2	BSA (m ²)	1.06 ± 0.02 / 0.86 - 1.18	1.05 ± 0.03 / 0.86 - 1.18	1.07 ± 0.03 / 0.90 - 1.18	0.71 ^{NS}	
3	Age (years)	4.20 ± 0.36 / 2 - 8	4.11 ± 0.49 / 2 - 6	4.20 ± 0.57 / 2 - 8	0.82 ^{NS}	
4	HR (bpm)	93.90 ± 4.21 / 60 - 120	93.20 ± 5.09 / 60 - 120	94.60 ± 6.98 / 60 - 120	0.87 ^{NS}	

5	RVDd (cm)	1.22 ± 0.08 / 0.61-2.07	1.29 ± 0.12 / 0.71-1.77	1.15 ± 0.12 / 0.61-2.07	0.63 ^{NS}	level of significance with 18 d.f.
6	IVSd (cm)	0.84 ± 0.05 / 0.40-1.18	0.87 ± 0.05 / 0.61-1.10	0.81 ± 0.08 / 0.40-1.18	0.77 ^{NS}	
7	LVDd (cm)	3.74 ± 0.14 / 2.84-5.11	3.80 ± 0.16 / 2.96-4.53	3.67 ± 0.24 / 2.84-5.11	0.62 ^{NS}	
8	PWd (cm)	0.87 ± 0.04 / 0.62-1.25	0.88 ± 0.06 / 0.67-1.12	0.86 ± 0.07 / 0.62-1.25	0.79 ^{NS}	
9	IVSs (cm)	1.13 ± 0.06 / 0.41 - 1.59	1.20 ± 0.09 / 0.78 - 1.59	1.05 ± 0.10 / 0.41 - 1.40	0.42 ^{NS}	
10	LVDs (cm)	2.67 ± 0.12 / 1.76 - 3.75	2.67 ± 0.15 / 1.84 - 3.49	2.66 ± 0.19 / 1.76 - 3.75	0.91 ^{NS}	
11	PWs (cm)	1.08 ± 0.05 / 0.64 - 1.56	1.09 ± 0.06 / 0.89 - 1.56	1.06 ± 0.08 / 0.64 - 1.55	0.76 ^{NS}	
12	EF %	58.80 ± 1.39 / 52 - 72	57.90 ± 1.82 / 52 - 70	59.70 ± 2.17 / 52 - 72	0.34 ^{NS}	
13	FS %	30.45 ± 0.96 / 26 - 40	30.00 ± 1.22 / 26 - 38	30.90 ± 1.54 / 26 - 40	0.45 ^{NS}	
14	LVM (gms)	120.20 ± 12.57 / 36 - 228	120.50 ± 14.83 / 42 - 220	119.90 ± 21.15 / 36 - 228	0.98 ^{NS}	
15	EPSS (mm)	3.08 ± 0.15 / 1.9 - 4.4	3.34 ± 0.14 / 2.4 - 3.9	2.82 ± 0.24 / 1.9 - 4.4	0.08 ^{NS}	
16	LA (cm)	2.46 ± 0.11 / 1.47 - 3.54	2.50 ± 0.21 / 1.47 - 3.54	2.42 ± 0.07 / 2.17 - 3.04	0.75 ^{NS}	
17	Ao (cm)	2.00 ± 0.06 / 1.43 - 2.66	1.99 ± 0.12 / 1.43 - 2.66	2.02 ± 0.05 / 1.78 - 2.23	0.83 ^{NS}	
18	LA:Ao	1.24 ± 0.03 / 1.03 - 1.52	1.27 ± 0.03 / 1.03 - 1.34	1.21 ± 0.05 / 1.03 - 1.52	0.31 ^{NS}	

NS: Non significant ($p \leq 0.05$), d.f.: degrees of freedom

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