

# NORMAL ECHOCARDIOGRAPHICAL PARAMETERS OF HEALTHY CAMEL (*Camelus dromedarius*)

A. Dehghan<sup>1</sup>, A. Rezakhani<sup>2</sup>, A. Veshgini<sup>3</sup>, M. Nasrollah Zadeh<sup>3</sup> and K. Bagheri<sup>4</sup>

<sup>1</sup>School of Veterinary Medicine, Islamic Azad University, Kazeroon branch, Kazeroon, Iran

<sup>2</sup>School of Veterinary Medicine, University of Shiraz, Shiraz, Iran

<sup>3</sup>School of Veterinary Medicine, Islamic Azad University, Sciences and Research Branch, Tehran, Iran  
Islamic Azad University, Kazeroon Branch, Kazeroon, Iran

## ABSTRACT

Normal echocardiographical values were investigated in twenty one year old clinically normal camels of both sexes and these were divided into two body weight of less than and more than 150 Kgs. Views were recorded while animals kept in standing position using 2-4 MHZ multi frequency phased array transducer. Long and short axes views from the right and the left cardiac areas were recorded. Mean and standard error of ejection fraction, fractional shortening, left ventricular volume during systole, left ventricular volume during diastole, left ventricular free wall thickness during systole, left ventricular free wall thickness during diastole, left ventricular internal diameter during systole, left ventricular internal diameter during diastole, inter ventricular septal thickness during systole, inter ventricular septal thickness during diastole, right ventricular internal diameter during systole and right ventricular internal diameter during diastole was  $84.9 \pm 0.47\%$ ,  $53.80 \pm 0.50\%$ ,  $25.48 \pm 1.48$  ml,  $157.75 \pm 4.49$  ml,  $2.33 \pm 0.066$  cm,  $1.60 \pm 0.059$  cm,  $2.61 \pm 0.061$  cm,  $5.65 \pm 0.069$  cm,  $2.40 \pm 0.082$  cm,  $1.43 \pm 0.062$  cm,  $1.58 \pm 0.063$  cm and  $2.35 \pm 0.065$  cm, respectively. The mean and standard error of the left atrial diameter during systole, diameter of the root of the aorta and the interval between the E point to the cardiac walls was  $5.44 \pm 0.071$  cm,  $5.51 \pm 0.35$  and  $0.63 \pm 0.003$  cm, respectively. There was no significant difference between males and females and two body weights.

**Key words:** Camel, echocardiography

Echocardiography is a noninvasive method for evaluation of the cardiovascular system in veterinary medicine about four decades ago. Many studies have been carried out on the normal parameters of animal echocardiography (Kuramoto 1990, Blissitt and Bonagura, 1995; Zucca *et al*, 2008) and many cardiac diseases (Buczinski *et al*, 2006; Reef, 1987 and Schmitz and Seahorn, 1994). The majority of clinical and research works have been published so far are related to small animals and horses (Long *et al*, 1992; O'Callaghan, 1985). Recently few papers appeared in veterinary literature about echocardiography of ruminants especially in cattle (Amory and Lekeux, 1992; Braun *et al*, 2001; Guglielmini, 2003). Available literature showed no published work on echocardiography of normal camels. This communication describes normal parameters of echocardiography of the dromedary camel.

## Materials and Methods

Twenty clinically healthy one year old dromedary camels (10 male and 10 female) were selected for this study after a careful general clinical examination in term of the temperature, respiratory

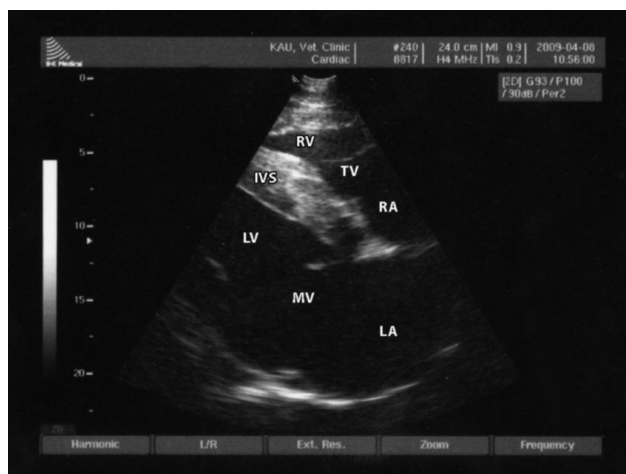
rates and pulse rates. The heart was examined by auscultation and electrocardiography. Those camels which were free of cardiac murmurs and arrhythmias and any other abnormalities were chosen for this study. Camels were divided into two groups on the base of body weight, e.g. less than 150 and more than 150 kilograms. Echocardiographs were taken (B.K. Medical Machine) with 2-4 MHZ multi frequency phased array transducer keeping camels in standing position without any sedatives or tranquilisers, restraining the young camels minimally. The right and left cardiac area from the third to sixth rib and from the point of shoulder and the point of elbow was clipped and cleaned with alcohol. Echocardiographic jelly was used at the time of recording. Long and short axis views from the right and left sides were recorded on DVD tape for later analysis. A pilot study was carried out on five camels for finding the land marks for best location. Simultaneous ECG was recorded on a base apex lead.

Transducer was placed parallel to ribs in the 5th intercostal space midway between the point of shoulder and the point of elbow, to obtain image

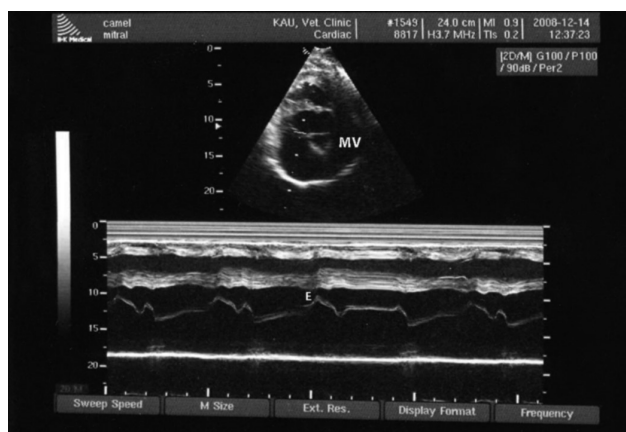
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of right parasternal long axis 4 chamber view, then the transducer placed slightly cranially to image left ventricular outflow tract (LVOT) (Fig 1). The transducer was placed in LVOT location but in the 4th intercoastal space and slightly craniodorsally to image right ventricular outflow tract (RVOT). The transducer, with 90-100 degree clockwise rotation, was placed vertically to the ribs direction in the 5th intercoastal space to image left ventricular short axis views. Slightly fanning the transducer to dorsal was necessary to image the mitral valve (Fig 2). The aortic valve was imaged by placing the transducer with 30 degrees clockwise rotation in the same location for the mitral valve (Fig 3). Both two-dimensional and M-mode were recorded for visualising the structures and measuring the chambers and thickness of the cardiac valves.

The values obtained in this study are given as mean±SE and analysed by using SPSS 015 software



**Fig 1.** This is a right parasternal long axis four chamber view. Right atrium (RA), right ventricle (RV), left atrium (LA), left ventricle (LV), inter ventricular septum (IVS), tricuspid valve (TV), and mitral valve (MV).



**Fig 2.** M- mode of mitral valve taken from the right short axis view. Mitral valve (MV) and E point (E).

and student T- test for comparing between males and females and two body weight groups.

## Results

Heart rates, respiratory rates, temperature and body weights recorded are given in Table 1. Statistical analysis showed no difference between males and females and body weight. Echocardiographic values of each camel are presented in Table 2. The interval from the point E to cardiac wall, the diameter of the root of aorta during diastole and the diameter of the left atrium are presented in Table 3. Statistically no difference was found in the echocardiographical values between males and females and two groups of body weight.

Diseases of the cardiovascular system have been reported in camels (Gutierrez *et al*, 2004). Therefore, it is prudent to have normal parameters of the cardiovascular system of this animal. Normal values of electrocardiogram (ECG) of large number of healthy dromedary have been reported previously (Rezakhani and Szabuniewicz, 1977). This study, for the first time, presents normal echocardiograms of the camel.

The heart in camel is located more caudally than the horse and cattle. Therefore, makes it easier to place the transducer in proper position without pulling the leg forward as it is in cattle. Although the ribs are wide and the intercoastal spaces are narrow but good quality echocardiograms were obtained in most cases. Other factor which helps to have good quality images is low heart rate. However, quality of images varied in some cases in this study due to the width of the ICS and demeanor of the camels. Young dromedary camels were chosen for this study as



**Fig 3.** M- mode of the aortic valve taken from the right short axis view. Aorta (Ao).

**Table 1.** Heart rates, respiratory rates, temperature and body weights of animals.

Sex	Body weight (kilogram)	Temperature (centigrade)	Respiratory Rate (R/min)	Heart Rate (bit/min)	Case number
Male	145	38.2	14	48	1
Female	145	37.9	14	48	2
Female	145	38.2	12	44	3
Female	145	37.8	10	50	4
Male	150	37.9	14	48	5
Female	150	38	14	46	6
Male	150	38.2	14	46	7
Male	150	38.3	12	46	8
Female	150	37.9	14	44	9
Male	150	38.7	12	44	10
Female	150	38.4	14	48	11
Male	145	39.1	14	46	12
Female	145	37.8	12	46	13
Male	145	38	14	48	14
Female	145	38.3	10	46	15
Male	145	37.9	10	50	16
Male	160	39.3	14	46	17
Female	160	38.2	14	46	18
Male	160	39.1	12	44	19
Female	150	38.3	12	44	20
mean±SE	149.25±1.16	38.27±0.99	12.80±0.33	46.40±0.42	

**Table 2.** Echocardiographic values of each camel.

EF (%)	FS (%)	LVVs (ml)	LVVd (ml)	LVFWs (cm)	LVFWd (cm)	LVIDs (cm)	LVIDd (cm)	IVSs (cm)	IVSd (cm)	RVIDs (cm)	RVIDd (cm)	Case no
86.06	55.94	19.53	140.11	2.10	1.37	2.37	5.38	2.10	1.19	1.37	10.2	1
85.94	55.78	19.53	138.91	2.06	1.35	2.37	5.36	2.04	1.17	1.28	06.2	2
86.38	56.34	18.92	138.91	2.07	1.32	2.34	5.36	2.07	1.15	1.33	08.2	3
86.47	56.41	18.31	135.34	1.99	1.29	2.31	5.30	1.98	1.11	1.22	01.2	4
82.52	52.10	30.86	176.59	2.55	1.84	2.85	5.95	2.78	1.66	1.86	2.63	5
82.71	52.28	30.07	173.88	2.49	1.81	2.82	5.91	2.74	1.63	1.83	2.60	6
81.31	50.82	34.15	182.75	2.74	1.96	2.97	6.04	2.84	1.76	1.94	2.73	7
83.91	53.60	27.01	167.88	2.38	1.72	2.70	5.82	2.63	1.53	1.72	2.51	8
83.97	53.55	24.84	154.93	2.34	1.62	2.61	5.62	2.36	1.45	1.60	2.35	9
84.40	54.03	23.67	151.78	2.29	1.58	2.56	5.57	2.31	1.40	1.55	2.30	10
83.81	53.42	25.80	159.40	2.38	1.69	2.65	5.69	2.43	1.51	1.67	2.41	11
86.03	55.92	19.74	141.31	2.11	1.39	2.38	5.40	2.13	1.20	1.39	2.11	12
84.98	54.66	21.87	145.57	2.17	1.45	2.48	5.47	2.14	1.27	1.39	2.16	13
85.85	55.71	20.16	142.52	2.13	1.39	2.40	5.42	2.13	1.21	1.40	2.21	14
86.35	56.25	18.32	134.16	1.99	1.29	2.31	5.28	1.94	1.10	1.10	1.98	15
86.61	56.57	17.73	132.41	1.94	1.24	2.28	5.25	1.91	1.07	1.19	1.97	16
81.79	51.33	33.03	181.37	2.72	1.88	2.93	6.02	2.82	1.77	1.86	1.86	17
81.16	50.66	34.43	182.75	2.74	1.94	2.98	6.04	2.85	1.82	1.95	2.75	18
80.88	50.41	36.15	189.03	2.84	1.99	3.04	6.13	2.93	1.89	1.95	19 2.76	19
80.83	50.32	35.57	185.53	2.78	1.97	3.02	6.08	2.88	1.80	1.97	2.77	20
84.9±0.47	53.80±0.50	25.48±1.48	157.75±4.49	2.33±0.066	1.60±0.059	2.61±0.061	5.65±0.069	2.40±0.082	1.43±0.062	1.58±0.063	2.35±0.065	mean±SE

**Table 3.** The interval from the point E to cardiac wall, the diameter of the root of aorta during diastole and the diameter of the left atria.

LAs (cm)	Aod (cm)	EPSS (cm)	Case no
5.18	5.56	0.64	1
5.12	5.54	0.65	2
5.15	5.51	0.64	3
5.07	5.47	0.60	4
5.73	5.35	0.66	5
5.70	5.32	0.63	6
5.85	5.43	0.64	7
5.60	5.24	0.65	8
5.42	5.81	0.65	9
5.37	5.75	0.62	10
5.47	5.86	0.61	11
5.20	5.57	0.62	12
5.23	5.64	0.62	13
5.21	5.58	0.63	14
5.09	5.44	0.65	15
5.05	5.24	0.62	16
5.82	5.41	0.64	17
5.87	5.46	0.63	18
5.94	5.53	0.66	19
5.89	5.48	0.62	20
5.44± 0.71	5.51± 0.35	0.63± 0.003	mean±SE

they are almost free of diseases and the weight is in a narrow range. On the other hand young camels are not accustomed to handling and restraining. The best person to handle is the caretaker who knows how to manage them. The reason why the values reported in this study were not statistically significant between males and females and the two body weight groups was due to narrow body weight range and the early age of camels.

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