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Anil Singh
Department of Veterinary Surgery and Radiology
College of Veterinary Science and Animal Husbandry, DUVASU, Mathura, Uttar Pradesh, India

RP Pandey
Department of Veterinary Surgery and Radiology
College of Veterinary Science and Animal Husbandry, DUVASU, Mathura, Uttar Pradesh, India

Gulshan Kumar
Department of Veterinary Surgery and Radiology
College of Veterinary Science and Animal Husbandry, DUVASU, Mathura, Uttar Pradesh, India

Prabha Sharma
Department of Veterinary Surgery and Radiology
College of Veterinary Science and Animal Husbandry, DUVASU, Mathura, Uttar Pradesh, India

Raveendra Tadagani
Department of Veterinary Surgery and Radiology
College of Veterinary Science and Animal Husbandry, DUVASU, Mathura, Uttar Pradesh, India

Corresponding Author:
Anil Singh
Department of Veterinary Surgery and Radiology
College of Veterinary Science and Animal Husbandry, DUVASU, Mathura, Uttar Pradesh, India

Pulse wave and colour doppler in Muzaffarnagari sheep

Anil Singh, RP Pandey, Gulshan Kumar, Prabha Sharma and Raveendra Tadagani

Abstract
Pulsed Doppler echocardiography of tricuspid and bicuspid flow is used to evaluate the diastolic filling non-invasively. Evaluation of intracardiac blood flow requires reference value which are poorly documented in sheep. The aim of the study was to establish the reference value of pulse wave measurement in healthy Muzaffarnagari sheep. The present study was conducted on twelve apparently healthy Muzaffarnagari sheep free from cardiothoracic diseases and allocated to two groups of 6 each order to establish the standard values (range) for parameters of the heart. The measured mean±S.E values of body weight and age were 17.83 ± 0.70 (10-20) kg, 4.67 ± 0.33(3-6) month and 37.58 ± 0.66(25-40) kg, 13.83 ± 0.40(12-15) month in animals of the groups-I and II, respectively. Doppler imaging allows evaluation of blood flow patterns and velocity, permitting documentation and quantification of valvular insufficiency or stenosis and cardiac shunts (Murat and Alkan, 2005) [1]. Concluding, Pulsed Doppler echocardiography allows measurement of intracardiac blood flow indices in sheep. The established reference values will help in interpreting these indices of cardiac function in clinical cardiac cases and sheep is used as an animal models in cardiovascular research in humans.

Keywords: Muzaffarnagari sheep, heart, pulse wave, colour doppler

Introduction
Doppler mode uses the change in frequency of an ultrasound beam when it is reflected from moving blood cells. Displayed graphically, it allows non-invasive evaluation of the timing, direction and character of blood flow within the heart. Three types of Doppler echocardiography are used clinically i.e. Pulsed Wave (PW), Continuous Wave (CW) and Colour Doppler (Boon, 2011) [2]. Pulsed wave Doppler is site-specific and used especially for low velocity (< 1.5 m/s), while CW Doppler is site-non-specific and used for velocity more than 1.5 m/s (Kienle and Thomas, 2002) [3]. Pulse-Wave, Continuous Wave and Colour-flow Mapping can provide more precise information about stroke volume (Ford and Mazzaferro, 2006) [4].

In sheep, Kirberger and Van Den Berg (1993) [5] recorded normal aortic flow from the apical five-chamber view with the sampling cursor in the ascending aorta. The flow had a rapid acceleration phase (down stroke) with the peak velocity being reached within the first third of systole and a deceleration phase (upstroke). The pulmonary artery (PA) flow profile, similarly to the aortic flow, is displayed as negative (below the baseline). It has a symmetrical profile with peak velocity about midway during ejection of blood (Boon, 2011) [2]. The initial peak velocity (E wave) corresponds to the rapid filling of the left ventricle in early diastole. The second peak velocity (A wave) corresponds to atrial contraction in the end of diastole. Distance between the two peaks depends on the heart rate (HR). The faster the heart rate, the shorter the diastolic period, the closer the two peaks move together.

In sheep, it has been recorded from the right parasternal short axis with the pulmonary valve and the pulmonary artery in view (Kirberger and Van Den Berg, 1993) [5].

Material and Method
The Doppler examination was performed to determine the velocity of moving blood with the animal positioned in right lateral recumbency. The examination was done from both cranial and caudal (apical) position. It was attempted to direct the transducer and the ultrasound beam as parallel as possible to the blood flow. The base of the heart and the great vessels were examined from the cranial position, while from the caudal (apical) position, the two-chamber,

four chambers and five chamber views of the heart was examined. All echocardiographic examination was performed using MyLab40vet ESAOTE INDIA and probe PA 122 by using 5.0-7.5 mHz. All examinations were performed with manual restraint of the animals, without the use of sedation or anaesthesia.

CF Doppler provides semi quantitative information of the severity of a regurgitant jet. Further, colour and pattern of the flow can also give an idea of the velocity of the blood. Turbulent flows can be presented with a mosaic pattern, which either encodes the varying velocities of the flow with different colors (red, blue, yellow and cyan) or encodes the areas of disturbed flow by mixing green with other colors usually red or blue (Boon, 2011) [2].

Examination was done to record unidirectional flow and regurgitant turbulent flow. The following parameter was measured in pulsed wave Doppler echocardiography:

i. Mitral velocity (m/sec) (Fig. 1).
ii. Mitral E/A ratio
iii. Tricuspid velocity (m/sec) (Fig. 2).
iv. Tricuspid E/A ratio
v. Main pulmonary artery velocity (m/sec) (Fig.3).
vi. Aortic velocity (m/sec) (Fig.4).

Statistical analysis

The mean and standard error for each set of radiographic, and echocardigraphic parameters were calculated, wherever applicable. Using SPSS software version 16.0, the data was analyzed by oneway analyses of variance (ANOVA). The parameters obtained from group-I and II were compared. Bivariate Pearson's correlation test was used to establish the correlation of various radiographic and echocardigraphic parameters with body weight and age of animals.

Result and Discussion

The mean E peak, A peak, and E/A value for peak mitral velocity and peak tricuspid velocity of group I was 0.51 ± 0.02, 0.32 ± 0.01 and 1.59 ± 0.04; 0.58 ± 0.03, 0.35 ± 0.02 and 1.66 ± 0.08 respectively whereas in group II it was 0.51 ± 0.03, 0.31 ± 0.03 and 1.66 ± 0.07; 0.51 ± 0.02, 0.32 ± 0.02 and 1.62 ± 0.06 respectively. The E peak and A peak for both peak mitral velocity and peak tricuspid velocity showed negative correlation with age and body weight, while the E/A for peak mitral velocity showed positive correlation with age and body weight whereas E/A for peak tricuspid velocity showed negative correlation with age and body weight.The mean pulmonary velocity and aortic velocity of group I was 0.69 ± 0.03 and 0.70 ± 0.02, where as in group II it was 0.64 ± 0.03 and 0.68 ± 0.01 respectively. As the study was conducted on healthy sheepColor Doppler echocardiograms showed unidirectional flow through Mitral valve, tricuspid, pulmonary and aortic valve with the absence of mosaic pattern (Fig. 4), as in sheep, the incidence risk of such disorders is estimated to be 0.1% (Dennis and Leipold, 1968; Dennis, 1993) [6, 7].

Table 5: Mean ± S.E values of various pulse wave Doppler echocardiographic parameters in measurements in sheep of group I and II.

Groups	Peak mitral velocity (m/sec)			Peak tricuspid velocity (m/sec)			Pulmonary velocity (m/sec)	Aorta velocity (m/sec)
	E peak	A peak	E/A	E peak	A peak	E/A		
Group-I	0.51 ± 0.02	0.32 ± 0.01	1.59 ± 0.04	0.58 ± 0.03	0.35 ± 0.02	1.66 ± 0.08	0.69 ± 0.03	0.70 ± 0.02
Group-II	0.51 ± 0.03	0.31 ± 0.03	1.66 ± 0.07	0.51 ± 0.02	0.32 ± 0.02	1.62 ± 0.06	0.64 ± 0.03	0.68 ± 0.01
Correlation with Age	-0.101	-0.233	0.382	-0.554	-0.400	-0.063	- 0.412	-0.295
Correlation with B.W.	-0.078	-0.221	0.393	-0.523	- 0.379	-0.073	- 0.436	-0.275

** Correlation is significant at the 0.01 level,*Correlation is significant at the 0.05 level

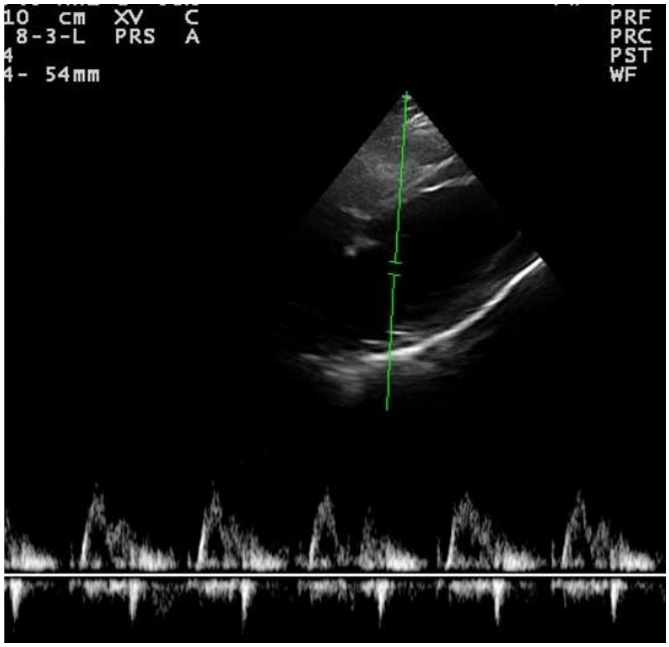

Fig 1: Pulse wave Doppler echocardiograms obtained from right parasternal long axis view showing Bicuspid flow velocitylandmarks.

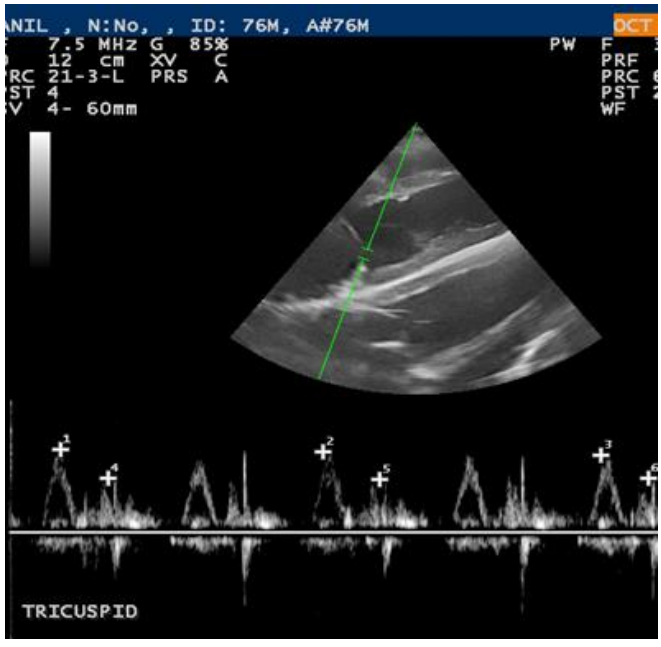

Fig 2: Pulse wave Doppler echocardiograms obtained from right parasternal long axis view showing Tricuspid flow velocity landmarks.

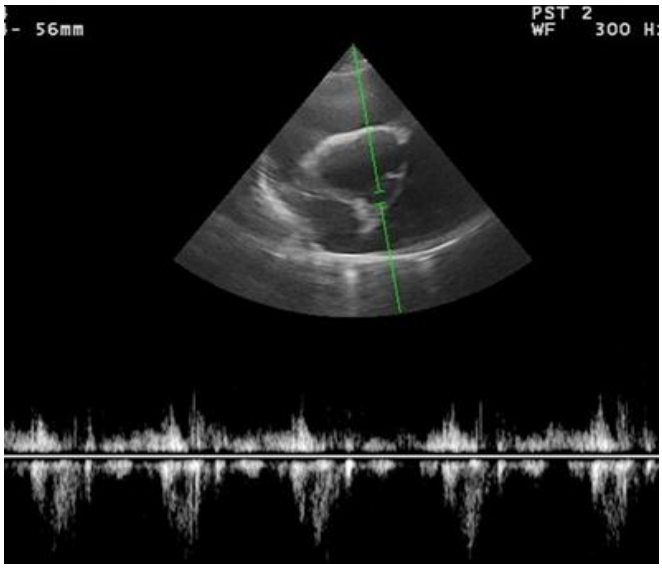

Fig 3: Pulse wave Doppler echocardiograms obtained from right parasternal view showing pulmonary flow velocity landmarks.

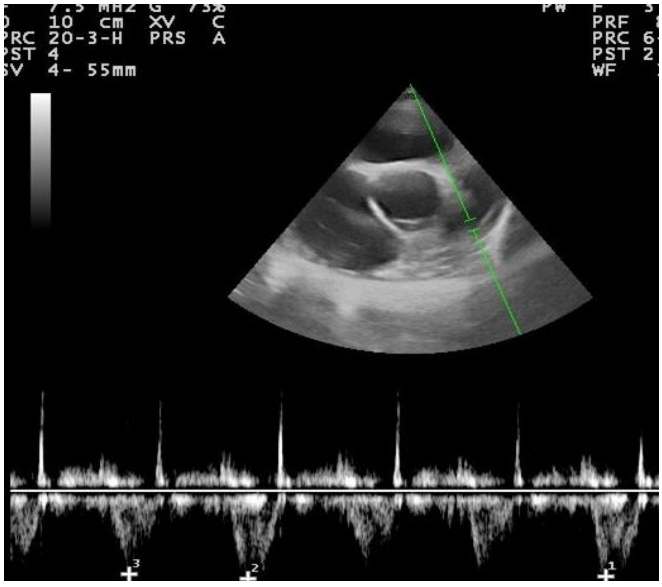

Fig 4: Pulse wave Doppler echocardiograms obtained from right parasternal view showing aorta flow velocity landmarks.

Fig 5: Color Doppler echocardiograms showing unidirectional flow through valve - absence of mosaic pattern.

Conclusion

The Mean ± S.E. values of the E wave peak velocity, ratio of E wave to A wave of tricuspid valve, pulmonary valve peak velocities and aortic valve peak velocities did not differ significantly ($p \geq 0.05$) between the sheep of group-I and group-II. Both pulmonary velocity and aorta velocity ($p \geq 0.05$) showed negative correlation with age and body weight.

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References

1. Murat K, Zeki A. Evaluation of Radiographical, Echocardiographical and Color-Doppler Findings of Heart Diseases in Geriatric Dogs. Turkish Journal Veterinary and Animal Sciences. 2005; 29:677-684.
2. Boon JA. Veterinary Echocardiography, edn 2. Wiley-Blackwell, Phlidalphia, 2011.
3. Kienle RD, Thomas WP. Echocardiography. In: Nyland, T.G. & Mattoon, J.S (Editors). Small Animal Diagnostic Ultrasound. 2 edition. W.B. Saunders Company, Philadelphia, USA, 2002, 354-423.
4. Ford RB, Mazzaferro EM. Kirk and Bistner's handbook of veterinary procedures and emergency treatment. 8edn. St. Louis, MO: Mosby Elsevier. 2006, 113-131.
5. Kirberger RM, Van Den Berg JS. Pulsed wave Doppler echocardiographic evaluation of intracardiac blood flow in normal sheep. Res. Vet. Sci. 1993; 55:189-194.
6. Dennis SM, Leipold HW. Congenital cardiac defects in lambs. Am. J. Vet. Res. 1968; 29:2337-2340.
7. Dennis S. Congenital defects of sheep. Vet. Clin. N. Am. Food Anim. Pract. 1993; 9:203-216.