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Research Article

A COMPARATIVE EVALUATION OF THE LEAD II ELECTROCARDIOGRAM IN YOUNG AND ADULT CROSSBRED COWS OF ODISHA

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ABSTRACT: The study was carried out to compare the electrocardiographic outline of young and adult crossbred cows of Odisha and to establish normal reference values of different ECG parameters. ECG was taken in all the animals in standing position. The lead II electrocardiogram was analyzed and data was compared using student's t-test. The P wave had a positive configuration in both young and adult animals. As far as the amplitude of P-wave was concerned, the young animals recorded significantly higher values than adults. The same trend was observed for QRS complex amplitude. The duration of QRS complex recorded almost similar values in young and adults without any significant difference. All QRS complexes and majority of T waves in lead II of adult animals presented a negative configuration. However, the T wave in most of the young animals had a positive configuration. The P-R interval was significantly lower in young animals than adults indicating faster atrioventricular conduction time in young animals. With respect to Q-T interval, the young animals and adults revealed no significant difference between each other with higher values recorded in adults. However, the R-R interval was significantly lower in young animals. The heart rate in young animals was found to be significantly higher than adults. The results of the study can be used as a standard during evaluation of cardiac status of crossbred cows.

Key words: Electrocardiogram, Base apex lead, Crossbred cows, Young and adults.

INTRODUCTION

Electrocardiogram (ECG) is the recording of the potentials generated by the electrical current due to the passage of cardiac impulses through the heart (Mohapatra *et al.* 2016, Sarangi *et al.* 2016). Heart disease in cattle remains medically challenging both to diagnose and to treat (Buczinski *et al.* 2010). Heart disease may ultimately lead to heart failure (HF) if the heart becomes overwhelmed by the progressively intensified compensatory neurohumoral response (De Morais *et al.* 2005). Electrocardiography can be used as a convenient mode for diagnosis of cardiac problems in cattle. The crossbred cows are one of the most preferred populations of cow for farmers in Odisha, India. This study was carried out to analyze the electrocardiograms of normal healthy crossbred cows both in young and adult animals. The measured electrocardiographic values can be used as a standard reference guide for diagnosing cardiac problems in crossbred. To the best of our knowledge this is the first study ever on the electrocardiogram pattern of crossbred cows of Odisha, India.

MATERIALS AND METHODS

Female young animals (less than six months of age, n=12) and cows (more than one year of age, n=12) constituted the study material. The animals were clinically examined and the animals having no history of any cardiac disorder or abnormal heart sounds were selected. Animals were kept in a standing position on a rubber mat without any sedative. A twelve-lead standard ECG recorder, Cardiart 108 MK-VII (BPL India) was used to record ECG. The electrocardiograph was set with a paper speed

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Table 1a. The mean ± SE values of the ECG parameters (Lead II) in young and adult crossbred Jersey cows.

Animals	P-wave amplitude (mV)	P-wave duration (sec)	QRS complex Amplitude (mV)	QRS complex Duration (sec)	T-wave amplitude (mV)
Young	0.19±0.01[a]	0.06±0.003[a]	1.32±0.06[a]	0.05±0.01[a]	0.2±0.01[a]
Adult	0.13±0.01[b]	0.05±0.003[a]	0.9±0.04[b]	0.05±0.01[a]	0.16±0.008[a]

Means having different superscripts in a column differ significantly ($p<0.05$).

Table 1b. The mean ± SE values of the ECG parameters (Lead II) in young and adult crossbred Jersey cows.

Animals	T-wave Duration (sec)	P-R interval (sec)	Q-T interval (sec)	R-R interval (sec)	Heart rate (beats per minute)
Young	0.07±0.01[a]	0.15±0.005[a]	0.27±0.008[a]	0.68±0.05[a]	91.23±7.15[a]
Adult	0.06±0.01[a]	0.21±0.008[b]	0.28±0.006[a]	1.02±0.07[b]	61.33±5.34[b]

Means having different superscripts in a column differ significantly ($p<0.05$).

of 25mm/sec and sensitivity of 1 (1 cm= 1mv) and the 50 HZ filter of the electrocardiograph was turned 'On'. The positive electrode of lead II was attached to the left leg and the negative electrode was attached to the right arm as described by Mendes *et al*. (2001). The lead II electrocardiogram was analyzed and data was compared using student's t-test. The study had been conducted in a non-invasive manner by just attaching painless clips to the animal body.

RESULTS AND DISCUSSION

The Mean ± SE values of the ECG parameters in young and adult crossbred cows are given in Table 1a and Table 1b. The amplitude of P wave measured between 0.1 mV and 0.15 mV in adult animals and 0.2 mV to 0.25 mV in young animals. They had a positive configuration (above the baseline) in young and adult crossbred cows. The duration of P wave ranged between 0.04 sec and 0.08 sec in young animals and adult animals recorded a range from 0.04 sec to 0.06 sec (Table 1a). The amplitude of QRS complex measured between 0.9 mV and 1.5 mV in young animals with a QS configuration (below the baseline) in 10 out of 12 animals. However, in adults it varied from 0.8 mV to 1.2 mV with QS configuration in all the animals (Table 1a). The QRS duration ranged between 0.04 sec and 0.12 sec in young animals while in adults it ranged from 0.04 to 0.08 sec (Table 1a). The amplitude of T wave recorded positively (ranging from 0.15 to 0.25 mV) in 8 out of 12 young animals and 2 out of 12 adult animals (ranging from 0.1 to 0.2 mV) (Table 1a). The duration of T wave measured between 0.04 sec and 0.12 sec in young animals while it ranged from 0.04 sec to 0.08 sec in adult animals (Table 1b). The PQ interval which indicates atrio-ventricular conduction time was recorded to vary between 0.12 sec and 0.18 sec in young animals whereas in adults it ranged from 0.18 sec to 0.24 sec (Table 1b). QT interval in young and adult animals ranged from 0.24 sec to 0.3 sec (Table 1b). The RR interval which represents a cardiac cycle had a wide range of 0.56 sec to 0.68 sec in young and 0.88 sec to 1.04 sec in adults (Table 1b).The heart rate varied from 88 beats per minute (bpm) to 107 bpm in young animals and between 58 bpm and 68 bpm in adults (Table 1b).

With respect to P-wave amplitude and duration, the young animals recorded significantly higher values than adults. Rezakhani *et al.* (2004) also recorded almost similar values of P-wave amplitude in dairy cows (Table 1a). Although the young animals recorded significantly higher values than adults for QRS complex amplitude but the duration of QRS complex recorded almost similar values in young animals and adults without any significant difference. The duration of QRS complex and T-wave recorded in our study were lower than those reported by Basoglu *et al*. (1992) for adult animals. All QRS complexes and majority of T waves in lead II of adult animals presented a negative configuration. The configuration of QRS complex amplitudes presented negative form because the waves Q and S were frequent in the major cases and R wave was short (Table 1a) (Mendes *et al.* 2001). However, the T wave in most of the young animals had a positive configuration. The variation in T wave configuration between young animals and cows might be due to difference in anatomical distribution of Purkinje fibers resulting in variable re-polarization time of the ventricles. The P-R interval was significantly lower in young animals than adults indicating faster atrio-ventricular conduction time in young animals (Table 1b). In addition, the values recorded

in the adults are in agreement with studies made by Rezakhani *et al*. (2004). Age dependant increase in electrocardiographic interval and changes in orientation of mean electrical axis in foals were also reported by Ayala *et al.* (1998).With respect to Q-T interval, the young and adults revealed no significant difference between them although higher values were recorded in adult animals (Table 1b). Similar values of QT interval were reported by Ghina *et al.* (2008) using lead II of Dubois lead. R-R interval in young animals was significantly lower than adults (Table 1b). The heart rate in young animals was found to be significantly higher than adults (Table 1b) and in line with those recorded in adult lactating Brown Swiss cows (Basoglu *et al*. 1992). However, Mir *et al.* (2000) reported higher heart rates in lambs in comparison to adult animals and suggested short PQ interval and shorter interval between cardiac cycles being the reason behind this. This study not only highlighted the variation in the electrocardiogram of young and adult crossbred cows but also laid down specific values of ECG parameters as well as the configuration of different ECG waves which could be referred by veterinary clinicians to diagnose abnormalities in the electrocardiogram of crossbred cows.

REFERENCES

Ayala I, Montes A, Benedito JL (1998) Modifications of the form and amplitude of electrocardiographic QRS complex during growth in the spanish-bred horse. J Vet Med 45: 309-317.

Basoglu A, Kursat T, Mahmut OK, Kadak R (1992) Electrocardiographic studies in Brown Swiss cows. S U Vet Fak Derg 8(1): 20-25.

Buczinski S, Rezakhani A, Boerboom D (2010) Heart disease in cattle: diagnosis, therapeutic approaches and prognosis. Vet J 184(3): 258-63.

De Morais H, Schwartz DS (2005) Pathophysiology of heart failure. In: Ettinger SJ, Feldman EC (Ed.), Textbook of Veterinary Internal Medicine, 6th edn., Saunders Elsevier, St Louis, Missouri. 914 - 940.

Ghina M, Cotor G, Braslasu C (2008) The values of some ECG components in dairy cows using dubois leads. Vet Med 65(1): 474.

Mendes LCN, Camacho AA, Alves ALG, Borges AS, Souza RCA, Ferreira WL (2001) Standard electrocardiographic values in Holstein calves. Arq Bras Med Vet Zootec 53(6): 641-644.

Mir SA, Nazki AR, Raina R (2000) Comparative electrocardiographic studies and differing effects of Pentazocine on ECG, heart and respiratory rates in young sheep and goats. Small Rumin Res 37: 13-17.

Rezakhani A, Paphan AA, Shekarfroush S (2004) Analysis of base apex lead electrocardiograms of normal dairy cows. Vet Arhiv 74(5): 351-358.

Mohapatra S, Sethy S, Bisoyi R, Jyotiranjan T, Mahapatra APK, Kundu AK (2016) Alterations in Electrocardiograms of Labrador Retriever dogs during handling with and without gloves. Explor Anim Med Res 6(2): 212-216.

Sarangi S, Mahapatra APK, Mohapatra S, Kundu AK (2016) Age-specific changes in electrocardiographic parameters in bipolar limb leads of conscious female native cats of Odisha. Vet World 9(2): 147- 150.

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