

A COMPARATIVE STUDY OF VARIOUS ELECTROCARDIOGRAPHY PARAMETERS AMONG DIFFERENT DOG BREEDS

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Electrocardiography (ECG) is non-invasive diagnostic tool used in veterinary critically ill patients for cardiac and extra-cardiac affections. The ECG is widely used for monitoring heart rate, cardiac rhythm and conduction of heart in dogs. The ECG Patterns may alter with respect to body weight, age and fat deposition due to alterations in electrical activity and heart rhythm. The present investigation was carried out on 18 dogs of three different breeds presented to the Veterinary Clinical Complex, College of Veterinary and Animal Science, Navania, Vallabh Nagar, Udaipur. The dogs were divided into two groups on the basis of gender and breed. The ECG recording of dogs was done at a paper speed of 50 mm/s and a calibration of 1 cm = 1 mV using the 3-channel leads of the Khera machine while the dogs were kept in a right lateral recumbent position. Heart rate, along with the amplitude and duration of different waves and complexes of ECG parameters were recorded. In the present study, heart rate was found highest in Labrador breed, followed by the Rottweiler and German Shepherd breeds. The heart rate was found highest among male. The amplitude and duration of waves did not vary significantly between breeds and gender.

Keywords: Breeds of dogs, Electrocardiography, German Shepherd, Labrador Rottweiler.

Cardiac diseases are fatal and frequently observed in dogs. According to studies from the American Veterinary Medical Association, one in ten dogs has heart problems (Schrope, 2015). In India, the incidence of heart disorders in dogs are also increasing similarly (Reetu *et al.*, 2017). The ECG is a non-invasive inexpensive method that is frequently used to monitor cardiac abnormalities as well as certain non-cardiac abnormalities like electrolyte imbalance, drug toxicity and hormonal imbalances. It is also used to measure heart rate, heart rhythm, conduction integrity and myocardial and pericardial affections (Baisan *et al.*, 2016; Bodh *et al.*, 2016). The aim of the current study was to produce some fundamental data on ECG parameters for future assessment. In the present investigation, the ECG parameters of three different breeds were observed which might be helpful to generate data among these breeds or between both the genders male and female.

Materials and Methods

This study involved 18 clinically healthy dogs of three different breeds who were of similar body weight and age group as the German Shepherd (n=6), Labrador (n=6) and Rottweiler (n=6) of both gender either male or female. The average age was 7.1 years. Out of the total studied dogs, 50% (n=9) were male and 50% (n=9) were female. The study was carried out at VCC, Navania, Udaipur, on dogs that were brought for routine health checkup or vaccination. Electrocardiography was recorded with a commercially available 3-channel ECG machine (Khera digital electrocardiograph). During recordings, all dogs were fully conscious with no chemical restraint. The dogs were placed in right lateral recumbency.

Standard 3 channels-lead ECGs (leads I, II, III, aVR, aVL and aVF) were recorded for all dogs following standard electrocardiographic guidelines. Recordings were made at a paper speed of 50 mm/sec. The amplitude and duration of the P-wave

were measured together with PR interval. HR was calculated by successive R-R interval. In statistical analysis one-way analysis of variance was used to test the significance of P wave using SPSS software version 15.0 (SPSS, Inc., Chicago, IL, USA).

Results and Discussion

There were no significant variations in ECG waves among different breeds or gender. Mean \pm SE of different ECG parameters with maximum and minimum values (Lead II) in different breeds of dogs has been presented in Table-1. The first positive deflection is known as amplitude of the P-wave and denotes atrial depolarization in lead-I, II, III and aVF as also recorded by Mukherjee *et al.*, 2020. The Q wave is the first negative deflection in lead-II and represents the electrical transmission into intra ventricular septum. The amplitude of R-wave is most commonly used to evaluate left ventricular function and is considered a good indicator for ventricular contractibility as also elicited by Gugjoo *et al.*, 2014. The ventricular depolarization is produced by the Q-wave of the QRS complex. The ventricular repolarization is represented by the T wave and it should be less than one-fourth the amplitude of the R wave. The QT interval is affected by ventricular repolarization. According to earlier studies there were no significant variations in Heart Rate, P- wave duration, P wave amplitude, PR interval, R-wave duration, R-wave amplitude, T-wave duration, T-wave amplitude and QT interval, among different breeds of dogs as also reported by Varshney *et al* 2020. In the present study heart rate was highest in Labrador (117 \pm 13.82) followed by the Rottweiler (103.8 \pm 4.22) and German Shepherd (90.16 \pm 6.7). In the present investigation the Labrador breeds had a higher heart rate compared to previous study as also recorded by Gugjoo *et al.*, 2014. Irrespective of age, breed and sex does not significantly alter heart rate as also mentioned

by Mukherjee *et al.*, 2020. The alteration of heart rate in different breeds of dogs observed in this study may occur due to various factors such as exercise, age, breed, body condition score, environmental temperature, motor activity, and sleep as also reported by Schreiner, 2016. The P-wave amplitude, P-wave duration, R amplitude, R duration, T-wave amplitude and T-wave duration were lower and the PR interval, QT interval were higher in German Shepherd and Labrador than in the earlier report of Mukherjee *et al.*, 2020. The P-wave amplitude was highest in Rottweiler (0.19 \pm 0.03961) followed by the German Shepherd (0.13 \pm 0.024) and Labrador (0.133 \pm 0.0166). The P-wave duration was highest in Rottweiler (0.031 \pm 0.00307) followed by the Labrador (0.03 \pm 0.003) and German Shepherd (0.025 \pm 0.004). The PR interval was highest in the German Shepherd (0.093 \pm 0.0084) followed by the Rottweiler (0.091 \pm 0.009) and Labrador (0.09 \pm 0.008). The R amplitude was highest in Rottweiler (1.158 \pm 0.101) followed by Labrador (1.08 \pm 0.135) and German Shepherd (0.373 \pm 0.196). The R duration was highest in the German Shepherd (0.036 \pm 0.004) followed by Labrador (0.033 \pm 0.005) and Rottweiler (0.03 \pm 0.004). The T amplitude was highest in Rottweiler (0.2 \pm 0.0465) followed by German Shepherd (0.191 \pm 0.027) and Labrador (0.163 \pm 0.045). The T duration was also higher in Rottweiler (0.05 \pm 0.005) than the Labrador (0.045 \pm 0.0098) and German Shepherd (0.045 \pm 0.003). The QT interval was highest in Labrador (0.05 \pm 0.005) followed by German Shepherd (0.045 \pm 0.0098) and Rottweiler (0.045 \pm 0.003). The heart rate was highest in males (107.44 \pm 10.45) and lowest in females (100 \pm 4.847) but there was no effect of sex on the P wave configuration. There were no significant differences in the various ECG parameters between different breeds and sexes. The values of different waves and complexes of ECG in different breeds and sexes are present in Table- 1.

Table1: MEAN ± SE OF DIFFERENT PARAMETERS WITH MAXIMUM AND MINIMUM VALUES (LEAD-II) IN DIFFERENT CANINE BREEDS AND GENDER

Breed	Heart Rate	P _{am} (mV)	P _{dur} (ms)	PR _i (ms)	R _{amp} (mV)	R _{dur} (ms)	Ta _{amp} (mV)	T _{dur} (ms)	QTi
German Shepherd	90.16 ± 6.7	0.13 ± 0.024	0.025 ± 0.004	0.93 ± 0.0084	0.373 ± 0.196	0.036 ± 0.004	0.191 ± 0.027	0.045 ± 0.003	0.19 ± 0.016
Labrador	117.1 ± 13.82	0.133 ± 0.0166	0.03 ± 0.0036	0.09 ± 0.00816	1.08 ± 0.135	0.033 ± 0.0055	0.163 ± 0.045	0.045 ± 0.0098	0.17 ± 0.037
Rottweiler	103.8 ± 4.22	0.19 ± 0.03961	0.031 ± 0.00307	0.091 ± 0.0098	1.158 ± 0.101	0.03 ± 0.00447	0.2 ± 0.04654	0.05 ± 0.005	0.165 ± 0.025

Gender	Heart Rate	P _{amp} (mV)	P _{dur} (ms)	PR _i (ms)	R _{amp} (mV)	R _{dur} (ms)	Ta _{amp} (mV)	T _{dur} (ms)	QTi
Male	107.44 ± 10.45	0.17 ± 0.027	0.028 ± 0.003	0.088 ± 0.005	1.063 ± 0.144	0.032 ± 0.0027	0.16 ± 0.021	0.042 ± 0.004	0.17 ± 0.02
Female	100 ± 4.847	0.127 ± 0.0168	0.028 ± 0.003	0.094 ± 0.008	1.06 ± 0.094	0.034 ± 0.004	0.20 ± 0.039	0.05 ± 0.005	0.17 ± 0.028

Conclusions

The present study provides reference values among the different breeds to assess future studies related to the ECG parameters.

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