ELECTROCARDIOGRAPHIC STUDIES IN CERTAIN BREEDS OF DOGS

C. Pavan Kumar¹, N. Syama Sundar², G. Praveena¹, B. Soma Sekhar Reddy¹ and R.V. Siva Kumar¹

¹Assistant Professor, ²Professor and Head, Department of Veterinary Medicine, College of Veterinary Science, Sri Venkateswara Veterinary University, Proddatur-516360,YSR District (A.P.).

[Received: 25.7.2015; Accepted: 28.01.2016]

This paper describes the normal electrocardiographic parameters of apparently healthy dogs (n=91) of various breeds viz Doberman (n=11), German shepherd (n=10), Labrador (n=18), Mongrel (n=14), Pomeranian (n=17), Pug(n=11) and Rottweiler(n=10) to establish the normal reference values and to evaluate the variations among different breeds. Electrocardiograms were recorded using bi-polar limb lead system using lead-II. Analysis of statistical data revealed significant difference for P-wave, R-wave and T-wave amplitudes among breeds. Significantly higher P-wave amplitude (0.189 mv), R-amplitude (1.007 mv) and T-wave duration (0.084 sec) were observed in mongrel dogs. There is no significant difference for heart rate, R-R interval, p-wave duration, P-R segment, Q-T interval and S-T segment among different breeds.

Key words: ECG; Dog breeds; limb lead system, lead-II.

Electrocardiography is a non-invasive and inexpensive tool that yields useful information which will reflect the heart’s electrical activity enabling evaluation of cardiac diseases especially in small animals (Harvey et al., 2005; Camachoet al., 2010). Electrocardiography is routinely employed in small animals to diagnose and monitor arrhythmias and conduction disorders, myocardial hypertrophy, electrolyte disorders, pericardial and pleural effusions and heart rate (Harvey et al., 2005). Electrocardiogram is a key examination tool in evaluating the effects of drugs on the cardiovascular system and is performed routinely in toxicological and pharmacological studies (Hanton and Rabemampianina, 2006). The use of clinical electrocardiography in Veterinary Medicine is becoming increasingly routine portion of the patient database and it is estimated that, as many as 10% of electrocardiograms taken will furnish very helpful information (Edwards, 1993).

It has been reported that, breed, age and sex would influence the electrocardiographic variations (Atmaca and Emre, 2010). Diversity is observed in electrocardiographic parameters among dog breeds (Dhanapalan et al., 1997; Hanton and Rabemampianina, 2006). The current study is aimed at providing reference data on certain dog breeds for clinicians and researchers.

Materials and Methods

In the current study, 91 apparently healthy dogs belonging to various breeds were subjected to electrocardiographic evaluation to establish the relation between breed and electrocardiographic parameters. The study was carried out in healthy dogs of the following breeds: Doberman(n=11), Germanshepherd(n=10), Labrador(n=18), Mongrel(n=14), Pomeranian(n=17), Pug(n=11) and Rottweiler(n=10). All the dogs appeared to be normal and healthy and faecal samples were found to be negative for parasitic ova. ECG recordings were taken using Cardiart 108 T Digio, BPL India by restraining the animals on a wooden table in right lateral recumbency by securing the fore limbs and hindlimbs separately and held perpendicular to the long axis of the body. Fore limb electrodes (RA and LA) were placed proximal to the olecranon on the caudal aspect and hind limb leads (RF and LF) over the stifle region at the anterior aspect of respective hind limb with prior application of conduction gel. The standard bipolar limb leads (lead II) were recorded at a paper speed of 25mm/sec, amplitude calibration of 10mm per1mv. An average of six (6) cardiac cycles were recorded and readings like interval-T; R-R and S-T segment) in seconds were analysed for further evaluation.
Table 1: Electrocardiographic parameters of different breeds

<table>
<thead>
<tr>
<th>S.No</th>
<th>Breed</th>
<th>Heart rate (bpm)</th>
<th>p-wave amplitude(mv)</th>
<th>R-amplitude (mv)</th>
<th>T-wave amplitude(mv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Doberman(n=11)</td>
<td>124.90±6.47</td>
<td>0.117±0.012</td>
<td>0.727±0.117</td>
<td>0.123±0.016</td>
</tr>
<tr>
<td>2</td>
<td>German Shepherd (n=10)</td>
<td>121.61±4.07</td>
<td>0.162±0.016</td>
<td>0.740±0.102</td>
<td>0.180±0.036</td>
</tr>
<tr>
<td>3</td>
<td>Labrador(n=18)</td>
<td>119.57±3.871</td>
<td>0.133±0.013</td>
<td>1.000±0.092</td>
<td>0.197±0.021</td>
</tr>
<tr>
<td>4</td>
<td>Mongrel(n=14)</td>
<td>119.706±7.048</td>
<td>0.189±0.014</td>
<td>1.007±0.089</td>
<td>0.190±0.075</td>
</tr>
<tr>
<td>5</td>
<td>Pomeranian(n=17)</td>
<td>118.546±7.288</td>
<td>0.116±0.018</td>
<td>0.681±0.104</td>
<td>0.266±0.048</td>
</tr>
<tr>
<td>6</td>
<td>Pug(n=11)</td>
<td>127.0±9.548</td>
<td>0.172±0.016</td>
<td>0.516±0.045</td>
<td>0.150±0.028</td>
</tr>
<tr>
<td>7</td>
<td>Rottweiler(n=10)</td>
<td>121.1±8.309</td>
<td>0.109±0.005</td>
<td>0.850±0.128</td>
<td>0.245±0.019</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R-R interval (sec)</th>
<th>p-wave duration (sec)</th>
<th>P-R segment (sec)</th>
<th>QT interval (sec)</th>
<th>S-T segment (sec)</th>
<th>T-wave duration (sec)</th>
<th>QRS width (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.506±0.024</td>
<td>0.035±0.003</td>
<td>0.097±0.006</td>
<td>0.138±0.029</td>
<td>0.116±0.008</td>
<td>0.049±0.004</td>
<td>0.039±0.001</td>
</tr>
<tr>
<td>0.484±0.015</td>
<td>0.042±0.004</td>
<td>0.116±0.007</td>
<td>0.192±0.019</td>
<td>0.085±0.016</td>
<td>0.080±0.009</td>
<td>0.040±0.003</td>
</tr>
<tr>
<td>0.513±0.023</td>
<td>0.039±0.003</td>
<td>0.110±0.004</td>
<td>0.191±0.007</td>
<td>0.066±0.005</td>
<td>0.061±0.006</td>
<td>0.043±0.002</td>
</tr>
<tr>
<td>0.226±0.035</td>
<td>0.064±0.02</td>
<td>0.098±0.006</td>
<td>0.189±0.003</td>
<td>0.019±0.006</td>
<td>0.084±0.014</td>
<td>0.052±0.002</td>
</tr>
<tr>
<td>0.488±0.037</td>
<td>0.039±0.003</td>
<td>0.117±0.006</td>
<td>0.243±0.006</td>
<td>0.070±0.012</td>
<td>0.075±0.006</td>
<td>0.031±0.003</td>
</tr>
<tr>
<td>0.527±0.037</td>
<td>0.049±0.015</td>
<td>0.093±0.006</td>
<td>0.181±0.011</td>
<td>0.067±0.008</td>
<td>0.055±0.008</td>
<td>0.034±0.002</td>
</tr>
<tr>
<td>0.500±0.035</td>
<td>0.040±0.002</td>
<td>0.100±0.008</td>
<td>0.208±0.007</td>
<td>0.068±0.006</td>
<td>0.082±0.007</td>
<td>0.040±0.002</td>
</tr>
</tbody>
</table>

*Means having different superscripts in a row differs significantly (p<0.05)

Statistical analysis
The data obtained were evaluated by one-way ANOVA and groups having significant differences were analyzed by the Duncans test (SPSS 17.0), adopting a significance level of 95% (p< 0.05). Results were shown in the form of mean± Standard error (SE).

Results and Discussion
There is no significant difference among the breeds with respect to heart rate and the values ranged from 63 to 167 bpm. However the mean heart rate was highest in pug which might be due to its smaller size. Similarly Dhanapalan et al. (1997) recorded lowest heart rate in Labrador and the highest in Spitz which were within the normal range. Similar findings were also reported by Fuentes et al., (2010) who attributed to the determinant of heart rate in dogs is autonomic tone.

The mean values of P-amplitude were found to be significantly highest in the mongrel (0.189±0.014 mv) and lowest in Rottweiler (0.109±0.005 mv) followed by Pomeranian (0.116±0.018 mv). P-wave was found to be positive in all the breeds.

Significantly highest amplitudes of R-wave were observed in Mongrel (1.007±0.089 mv) and lowest in Pug (0.516±0.045 mv). The higher R-amplitude was observed in thin chested breeds than broad or round chested. The R-wave amplitude is higher in larger breeds (mongrel and Labrador) and smaller in toy breeds (pug and Pomeranian). This finding is in agreement with those of Edwards (1993), Tilley (1999) and Venkateswarlu et al. (1997) also recorded R-wave amplitude in a range of 0.4-1.9 mv in mongrel dogs. Ettinger and Sutter (1970) also recorded maximum R-wave amplitude of 2.563 mv in adult dogs.
These variations could be due to variation in size of the breeds.

ECG of Mongrel

ECG of Pug

ECG of Pomeranian

ECG of Doberman

ECG German Shepherd

ECG Labrador

ECG Rottweiler

Fig. Electrocardiographic observations of different breeds
Three types of variable T-wave orientation were observed i.e., positive (72%), negative (24%) and biphasic (4%). However, Venkateswarlu et al. (1997) observed 25% of T-waves in positive and 75% in negative orientation in lead-II. This variation can be attributed to random repolarisation of the small animal myocardium whereas very organized and always positive T-wave in human as also reported by Martin (2007). Significantly higher amplitude of T-wave was recorded in Pomeranian and Rottweiler which was not exceeding 25% of the R-amplitude.

There is no significance difference among breeds with respect to R-R interval (0.10-0.76 sec), p-wave duration (0.02-0.32 sec), P-R segment (0.16-1.20 sec) and Q-T interval (0.02-1.20 sec).

Significantly higher S-T segment was observed in Doberman (0.116±0.008sec) followed by German shepherd (0.085±0.016sec) and remaining breeds showed with little variation within the normal range i.e., < 0.2mV not exceeding two (2) small boxes as also mentioned by Edwards (1993).

QRS interval duration was found to be significantly higher in mongrel dogs (0.052±0.005sec) and lower in Pomeranian (0.031±0.003sec) and Pug (0.034±0.002) varying in between 0.03-0.08sec, which is correlating with the findings of Venkateswarlu et al. (1997).

Conclusion

Electrocardiographic parameters among various apparently healthy dog breeds were established in the current study which can be used as reference values for the respective breeds for research and clinical practice. This study reports that P-wave, R wave and T-wave amplitudes vary significantly among the different dog breeds.

Acknowledgement

The authors are grateful to the Associate Dean, CVSc, Proddatur and authorities of Sri Venkateswara Veterinary University, Tirupati for providing facilities to undertake the current study.

References


