

ELECTROCARDIOGRAPHIC OBSERVATIONS IN GASTROENTERITIS AFFECTED DOGS[#]

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ABSTRACT

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The present study was conducted to investigate characteristics of electrocardiography in gastroenteritis (GE) in dogs. The positive cases of GE (Gr. B) affected dogs were screened for ECG and haemato-biochemical parameters as per the standard procedure and the outcome was compared and correlated statistically with healthy dogs (Group A). A decreased in amplitude of P wave, T wave and QRS complex were observed in GE affected dogs as compared to Group A. Additionally, a significant ($P < 0.05$) decreased in Hb, PCV, TEC, MCHC and TP and increased in AST and ALT were also noted in Group B. There was significant ($P < 0.05$) positive and negative correlations between electrocardiogram and haemato-biochemical parameters were observed in GE affected group. The study revealed that ECG and haemato-biochemical parameters had a significant role in gastroenteritis diseases in dogs.

Keywords: ECG, GE (gastroenteritis), dog

Introduction

Electrocardiography, a non-invasive and relatively inexpensive technique has now generally been accepted as an important diagnostic tool in detecting cardiac abnormalities in dogs (Tilley, 1992). It detects not only the disturbances of cardiac rate and rhythm but also cardiac enlargement, myocardial disease, ischaemia, pericardial diseases, certain electrolyte imbalances and some drug toxicities. The electrocardiogram is a basic and valuable diagnostic test in veterinary medicine and is relatively easy to acquire. The electrocardiogram is the initial test of choice in the diagnosis of cardiac arrhythmias and may also yield information regarding chamber dilation and hypertrophy. Electrocardiography (ECG) is an important diagnostic tool in the practice of veterinary medicine. It is not only evaluates the electrical function of the heart, but ECG is also able to give information regarding non-cardiac illness. When performing ECGs, it is important to recognize the limitations as well as the benefits of their uses in clinical practice. Dehydration is seen in clinical condition like gastroenteritis, diarrhoea, vomition etc. (Chakrabarti, 1994). Severity of dehydration can be conveniently diagnosed by haemato-biochemical analysis but these are time consuming. Electrocardiography may be taken as a tool for the easy and quick diagnosis of the case of dehydration and electrolyte imbalance for their early treatment without losing valuable time to save the life of ailing animals (Hammer, 1978) and (Dhanapalan *et al.*, 1993).

Materials and Methods

The present study was carried out at Teaching Veterinary Clinical Complex (TVCC) and Division of Veterinary Medicine, Faculty of Veterinary Sciences and Animal Husbandry, Sher-e-Kashmir University of Agricultural Sciences and Technology, R.S. Pura, Jammu. The dogs were selected on the basis of having principal complain of diarrhoea and vomition for GE patients and having complained of polyuria, anuria, dysuria, anaemia, halitosis. The dogs brought to TVCC for routine

checkup and having up to date vaccination and deworming status and normal clinico-physiological parameters were taken as healthy control. The animals were divided into two groups viz. Gr. A (healthy dogs), Gr. B (GE affected dogs) comprising six dogs in each group. Under clinical examination, the conjunctiva, oral mucosa, heart rate, pulse, respiration and temperature were recorded. A detailed auscultation of all the four quarters was done. The size and shape of chest and abdominal cavity were also determined. A 12 lead standard ECG recorder, BPL CARDIART-6208 machine under all standard prescribed conditions was used in present study. The electrocardiograph has been standardized 1cm = 1 mV so that each small box on the vertical axis equals 0.1 mV. The tracings were recorded at a paper speed of 50 mm per second so each small box on horizontal axis equals 0.02 seconds. The details of lead- II were included in this study. Electrocardiogram was then analyzed for the presence of ECG abnormality, if any. The ECG was recorded with dog in standard body position (Tilley, 1992) i.e. restrained in right lateral recumbency on a wooden table with legs positioned parallel to each other and perpendicular to the long axis of body, and keeping the head and neck flat. The skin and electrodes were moistened with gel. The owner's presence at the end of the table was ensured in all cases to keep the dog calm and comfortable. No pharmacological preparation was used for restrain prior to ECG examination. The front leg leads or electrodes (RA and LA) were attached to the appropriate forelegs just above the elbow. The rear leg leads (RL and LL) are likewise attached to the appropriate rear leg immediately proximal (above) to stifle (knee). The ECG parameters viz. P wave, QRS complex, T wave amplitude and duration, PR interval, QT interval and ST segment were recorded in each case. Eight ml of blood samples from each dog were collected from cephalic vein/saphenous vein. Two ml of blood was transferred to a EDTA vial for haematology estimation and 6 ml blood was transferred to clot activator vial and serum was separated and kept in -20 degree centigrade for future study.

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Haematological parameters viz. Hb, PCV, TEC, MCV, MCH, MCHC, RDW, TLC and DLC (Neutrophil and lymphocyte) were determined as per the standard procedure (Jain *et al.*, 1986) The serum biochemical parameters viz. total protein, albumin, globulin, albumin:globulin (A:G ratio), creatinine, blood urea nitrogen (BUN), asparatate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP), total bilirubin, indirect bilirubin, calcium, phosphorus, sodium, potassium and chloride were analyzed by automated biochemical analyzer (Chem-7, ERBA Company Ltd.) with the help of commercial kits (ERBA company Ltd).

Results and Discussion
Electrocardiography studies

The results of ECG of Gr.B affected dogs are shown in Table 1 and Fig 1, 2, 3. Present study revealed that Pa (0.15 ± 0.12 mv and 0.13 ± 0.10 mv), QRSa (1.68 ± 0.24 mv and 0.78 ± 0.11 mv) and Td (0.04 ± 0.02 sec and 0.04 ± 0.01 sec) in Gr.B were significantly ($P < 0.05$) decreased as compared to Gr. A dogs (Table 1). The decreased level of ECG parameters in Gr. B might be due to dehydration haemodilution and anaemia which caused decreased myocardial oxygenation, as a result myocardial hypoxia developed.

Alteration of haemogram

There was significant ($P < 0.05$) decrease in Hb, PCV, TEC and MCHC in Gr. B when compared to Gr. A (Table 2). But there was significant ($P < 0.05$) increase in MCV in both Gr. B dogs as compared to healthy dogs in present study (Table 2). Decreased levels of haemoglobin, total erythrocyte count and packed cell volume were also noticed by (Dharmadheeran *et al.*, 2003), (Biswas *et al.*, 2005), (Lee *et al.*, 2012) and (Ali *et al.*, 2014). Observed decrease Hb, PCV, TEC and MCHC in Gr. B might be due to anaemia in haemorrhagic gastroenteritis (Mohan *et al.*, 1994), dehydration (Rai *et al.*, 1994) and mechanical obstruction and massive sloughing of intestinal epithelial cells (Mallela *et al.*, 2006).

Biochemical analysis

Biochemical analysis in present study (Table 3) revealed that there was significant ($P < 0.05$) decrease of AST (76.33 ± 5.46 IU/L and 110.83 ± 4.91 IU/L), ALP (114.44 ± 8.20 IU/L and 133.83 ± 5.55 IU/L) in Gr. B as compared to Gr. A (AST- 58.28 ± 3.97 IU/L and ALP- 92.35 ± 6.85 IU/L). But ALT (95.5 ± 3.87 IU/L), BUN (188.5 ± 7.61 mg/dl), creatinine (6.81 ± 1.92 mg/dl) and P (8.62 ± 2.56 mg/dl). The Albumin level in case of Gr. B (2.18 ± 0.53 g/L) was significantly ($P < 0.05$) decreased as compared to Gr. A (Table 3). The rest biochemical did not show any significant alteration as compared to healthy dogs. These observations are in corroboration with the findings of (Dharmadheeran *et al.*, 2005) and (Shah *et al.*, 2013). Decrease in Albumin and increase AST in gastroenteritis infected dogs might be due to involvement of liver and severe protein losing enteropathy due to intestinal villi damage or intestinal haemorrhage (Grigonis *et al.*, 2002). Increase in ALP might be due to hepatic hypoxia secondary to severe hypovolemia or the absorption of toxic substances due to loss of the gut barrier (Shah *et al.*, 2013).

Correlation studies

The correlation statistic between ECG and haematology of GE affected dogs revealed a positive correlation between Pd and MCH and QRSa and PCV (Table 4). Similarly positive correlation between Pd and TP, QRS and AST, QT_i and globulin and PR_i with Globulin and creatinine were recorded in this study (Table 5 and Fig. 10). But QT_i and PR_i were negatively correlated with ALP.



Fig. 1: ECG of 3 year old, male GSD dogs suffering from GE. Decrease in Pa and QRSs clearly visible.

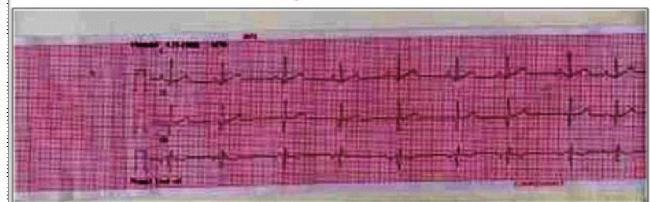


Fig. 2: ECG of 18 month old male Labrador dogs suffering from HGE, almost absence of P wave or significant decrease in Pa, QRSa and Ta is noticeable

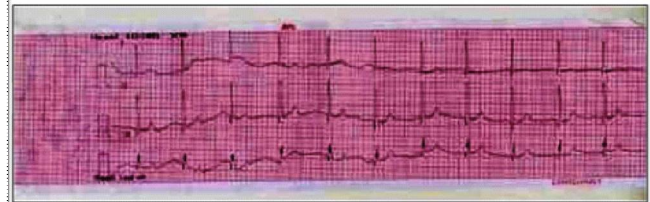


Fig.3: ECG of 02 year old female GSD with CPV infection. Absences or decrease in Pa, R alteration and decrease in Ta is visible

Table 1: Mean±SE values of electrocardiogram of healthy, gastroenteritis disease affected dogs

ECG Parameters	Gr. A (n=6)	Gr.B (n=6)
Pa (mV)	0.31±0.09	0.15±0.12*
Pd (sec.)	0.03 ± 0.13	0.03 ± 0.02
QRSa (mV)	2.50 ± 0.21	1.68 ± 0.24*
QRSd (sec.)	0.05 ± 0.00	0.04 ± 0.02
Ta (mV)	0.35 ± 0.15	0.24 ± 0.12
Td (sec.)	0.23 ± 0.81	0.04 ± 0.02*
STs (sec.)	0.15 ± 0.05	0.14 ± 0.02
QTi (sec.)	0.17 ± 0.02	0.16 ± 0.02
PRi (sec.)	0.07 ± 0.01	0.09 ± 0.05

*P≤ 0.05 Gr.A=Healthy, Gr.B=Gastroenteritis

Table 2: Mean±SE values of haematological parameters of healthy, gastroenteritis disease in dogs

Parameters	Gr. A (n=6)	Gr. B (n=6)
Hb (g/dl)	15.28 ± 1.35	11.7 ± 1.71*
PCV (%)	44.53 ± 2.30	34.0 ± 6.94*
TEC (x106/µl)	6.96 ± 0.48	4.29 ± 0.34*
MCV (fL)	65.71 ± 6.83	78.71 ± 8.84*
MCH (pg)	22.07 ± 2.97	21.3 ± 1.99
MCHC (g/dl)	33.58 ± 2.80	27.65 ± 2.20*
RDW (%)	12.69 ± 0.48	13.1 ± 1.47
TLC (x103/µl)	11.88 ± 0.84	12.1 ± 1.55
Neutrophils (%)	72.58 ± 2.73	74.27 ± 2.38
Lymphocytes (%)	18.68 ± 3.33	18.68 ± 3.33

*P≤ 0.05

Table 3: Serum biochemical profile of healthy, gastroenteritis disease affected dogs

Parameters	Gr. A (n=6)	Gr. B (n=6)
AST (IU/L)	58.28 ± 3.97	76.33 ± 5.46*
ALT (IU/L)	31.96 ± 6.07	23.22 ± 5.21
ALP (IU/L)	92.35 ± 6.85	114.44 ± 8.20*
TB (mg/dl)	0.30 ± 0.17	0.23 ± 0.13
IB (mg/dl)	0.10 ± 0.08	0.18 ± 0.12
TP (g/L)	6.73 ± 0.19	5.63 ± 0.70
Albumin (g/L)	3.55 ± 0.40	2.18 ± 0.53*
AG Ratio	1.13 ± 0.24	0.66 ± 0.22
BUN (mg/dl)	14.26 ± 5.13	19.49 ± 5.02
Creatinine (mg/dl)	0.83 ± 0.36	1.06 ± 0.47
Ca (mg/dl)	8.76 ± 0.89	9.18 ± 1.31
P (mg/dl)	4.38 ± 0.35	5.42 ± 2.38
Na (mEq/L)	143.66 ± 9.13	141.68 ± 8.60
K (mEq/L)	4.53 ± 0.53	3.37 ± 1.20
Cl (mEq/L)	117.5 ± 5.52	102.11 ± 6.35

*P ≤ 0.05

Table 4: Correlation between ECG and haemogram of gastroenteritis disease affected dogs

Parameters	Pa	Pd	QRSa	QRSd	Ta	Td	STs	QTi	PRI
Hb	-0.11	-0.06	0.34	0.12	0.52	0.10	0.50	0.14	0.34
PCV	0.15	0.46	0.75*	-0.11	0.39	0.05	0.22	0.48	0.44
TEC	0.30	0.22	0.41	0.03	0.21	-0.10	0.09	0.17	0.31
MCV	0.20	0.40	0.42	0.22	0.13	-0.16	0.39	0.16	0.16
MCH	0.57	0.70*	0.46	-0.11	-0.34	-0.55	0.07	0.09	0.45
MCHC	-0.00	-0.16	-0.18	-0.30	-0.20	-0.12	-0.52	0.04	-0.02
RDW	-0.00	-0.11	-0.28	-0.03	-0.11	-0.03	-0.13	0.23	-0.09
TLC	0.08	0.33	0.51	0.11	0.38	-0.04	0.53	0.25	0.25
Neutrophil	0.17	0.02	0.46	-0.03	-0.47	-0.33	-0.21	-0.46	-0.33
Lymphocyte	0.12	0.23	0.35	0.12	0.27	0.08	0.11	-0.67	0.49

*P ≤ 0.05

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Table 5: Correlation between ECG and biochemical of gastroenteritis disease affected dogs

Parameters	Pa	Pd	QRSa	QRSd	Ta	Td	STs	QTi	PRI
AST	0.38	0.63	0.68*	0.06	0.13	-0.20	0.31	0.56	0.57
ALT	0.30	0.57	0.63	0.07	0.20	-0.11	0.36	0.62	0.48
ALP	-0.22	-0.34	-0.56	0.04	-0.30	0.06	-0.21	-0.67*	-0.80**
TB	0.21	0.43	0.67	-0.08	0.42	-0.00	0.35	0.78	0.79
IB	0.33	0.60	0.67	-0.11	0.30	-0.10	0.41	0.82	0.79
Albumin	0.17	0.31	0.08	0.03	-0.25	-0.12	0.01	-0.05	-0.24
Globulin	0.37	0.51	0.69	0.01	0.21	-0.18	0.18	0.69*	0.82**
AG ratio	-0.10	-0.11	-0.37	0.02	-0.32	-0.10	-0.44	-0.67	-0.22
BUN	0.48	0.38	-0.19	0.41	-0.07	-0.07	0.48	0.49	0.87**
Creatinine	0.14	0.23	0.35	0.12	0.27	0.08	0.11	-0.67	0.49
Ca	0.28	0.39	-0.19	0.35	-0.10	-0.10	0.22	-0.00	0.21
P	0.21	0.40	0.13	-0.08	-0.16	-0.22	0.06	-0.04	0.69
Na	-0.42	-0.06	0.39	0.08	0.08	-0.08	-0.55	-0.53	0.65
K	-0.01	0.03	-0.41	-0.15	0.14	-0.14	0.07	-0.15	-0.41
Cl	-0.08	-0.43	0.08	-0.27	-0.02	-0.04	-0.26	-0.07	-0.70

*P ≤ 0.05** P ≤ 0.01

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