STUDIES ON BIOCHEMICAL CHANGES AND THERAPEUTIC MANAGEMENT OF METABOLIC SYNDROME IN DOGS

Siji.S.Raj[1], N. M. Unny[2], S. Ajithkumar[3], R. Uma[4], V.L. Gleeja[5] and N.P. Usha[6]
Department of Veterinary Clinical Medicine, Ethics and Jurisprudence
College of Veterinary and Animal Sciences, Mannuthy

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Abstract

Twelve obese dogs with metabolic syndrome were treated with ezetimibe @ 0.1mg/kg bodyweight for a period of 30 days. The variation in biochemical values and bodyweight after therapy is reported.

Key words*: Body condition score, obesity, canine metabolic syndrome, ezetimibe*

The number of obesity cases among pet population appears to be increasing day by day and it is considered to be a major disease complex in companion animals.Dogs are considered to be affected with metabolic syndrome if it has central obesity and any two of following three factors,plasma glucose level ≥ 120 mg/dl, hyperlipidemic condition (triglyceride ≥ 165 mg/dl, total cholesterol ≥ 200 mg/dl, non-esterified fatty acids ≥ 1.5 m/Eq) and alanine aminotransferase activity ≥ 100 IU/L (Kawasumi*et al*., 2012). This paper describes twelve cases of canine metabolic syndrome associated with obesity and its management with ezetimibe.

Materials and Methods

Twelve apparently healthy obese dogs with body condition score (BCS) eight were selected for the study.Biochemical evaluations were conducted in all the cases on both 0th and 30th day of observation. Treatment was given with ezetimibe @ 0.1mg/kg bodyweight per os for 30days and the response was studied. Statistical analysis of the biochemical data before and after therapy was carried out using paired t test described by Kaps and Lamberson (2009) with software, SPSS version 21.0.

Results and Discussion

Twelve animals selected for the study had excess body weight with a BCS eight in scale of one to nine Laflamme classification (Laflamme,1997). According to Gossellin *et al*. (2007) BCS was one of the best methods to assess the obesity in dogs.

The mean body weight of the animals before start of the treatment was

1. *MVSc Scholar*
2. *Assistant Professor*
3. *Professor and Head, Teaching Veterinary Clinical Complex*
4. *Assistant Professor, Department of Veterinary Biochemistry*
5. *Assistant Professor, Department*

31.20±4.029Kg. After 30 days of treatment, mean bodyweight showed a significant reduction (30.00±4.03Kg).

Serum biochemical analysis (Table 1) showed hyperlipidemia, an increased blood glucose level, increased alanine aminotransferase and gamma glutamyltransferase activity on the day of admission.A high value of triglyceride was recorded (202.76±33.60 mg/dl)on the day of admission. Jeusette *et al.* (2005) observed that severe chronic obesity induced a significant increase in triglyceride concentration in dogs. A significant decrease in triglyceride values after treatment (107.53±11.79 mg/dl)was recorded.Similar reports were found in rats with use of ezetimibe (Pandya *et al*., 2006). A significant decrease was noticed in the serum total cholesterol level when compared to day of admission (253.21±15.56 mg/dl) and after the treatment (153.95±10.71 mg/dl). Pena *et al*. (2008) explained higher cholesterollevels in canine obesity. The reduction in cholesterol value after therapy could be due to prevention of intestinal cholesterol absorption as well as biliary cholesterol absorption by ezetimibe(Davis *et al*., 2001).It effectively reduced the low density lipoproteinfrom 174.36±12.17 mg/dl to69.44±10.32mg/dl and increased the high density lipoprotein after therapyfrom 38.29±2.67mg/dl to 62.99±3.07 mg/dl. This is in accordance with Kosoglou *et al*. (2000).

The levels of alanine aminotransferase and gamma glutamyltransferase were recorded as high at the start of study. Tribudharatana *et al*. (2011) reported fat accumulation in the liver associated with canine metabolic syndrome. It was opined that body fat was positively correlated with activity of alanine aminotransferase.After 30 days of therapy, alanine aminotransferase and gamma glutamyltransferase was reduced to normal range. Ezetimibe showed a reduced serum alanine aminotransferase in hepetic steatosis (Loomba *et al*., 2015). Secondary accumulation of fat in liver tissue caused increased gamma glutamyltransferase activity (Hess *et al*., 2000). Ezetimibe treated group showed a reduced gamma glutamyl transferase in hypercholesteremic mice (Mohammadi *et al*., 2014).

The serum glucose value on the day of admission was 122.62±4.54mg/dl. This corroborates with the reports of Bergman *et al.* (2006) who proposed that increase in delivery of free fatty acid from fat depots to liver might be the main reason for insulin resistance in metabolic syndrome. Even though glucose values declined after therapy, statistically there was no significant difference (5% level)but had reduced to the normal range for the species.

Ezetimibe was found to be effective in reducing the bodyweight and the biochemical parameters *viz.* triglyceride, cholesterol, high density lipoprotein, low density lipoprotein, very low density lipoprotein, alanine aminotransferase and gamma glutamyl transferase. Increase in high density lipoprotein recorded also has a beneficial effect.

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Table 1. Serum biochemical studies in animals treated with ezetimibe

PARAMETERS	0th Day	30th Day
Glucose(mg/dl)	122.62±4.54	96.58±5.94
Triglyceride(mg/dl)	202.76±33.60[a]	107.53±11.79[b]
Cholesterol(mg/dl)	253.21±15.56[a]	153.95±10.71[b]
High Density Lipoprotein(mg/dl)	38.29±2.67[a]	62.99±3.07[b]
Low Density Lipoprotein(mg/dl)	174.36±12.17[a]	69.44±10.321[b]
Very Low Density Lipoprotein(mg/dl)	40.55±6.72[a]	21.50±2.35[b]
Alanine aminotransferase(IU/L)	106.78±3.38[a]	62.53±6.04[b]
Gamma glutamyltransferase(IU/L)	4.70±0.250[a]	3.07±0.604[b]

Means with different superscript (a-b within row) differ significantly at 5% level.

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