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THE IMPACT OF SLEEVE GASTRECTOMY ON BODY WEIGHT, CHOLESTEROL, TRIGELCERIDES, BLOOD GLUCOSE, AND INSULIN LEVELS IN OBESE DOGS

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ABATRACT

Obesity adds great stress to obese dogs, as well as the veterinary health-care system. Sleeve gastrectomy is one of the most effective treatments for obesity and its comorbidities. Sixteen obese dogs were recruited into the study. The aim of this study was to evaluate sleeve gastrectomy as a bariatric intervention for obese dogs by estimating body weight, cholesterol, triglyceride, blood glucose, and insulin levels. Postoperatively, we compare the body weight, cholesterol, triglycerides, blood glucose, and insulin with a fixed average test value. Sixteen obese dogs were subjected to open sleeve gastrectomy. Estimated body weight, cholesterol, triglycerides, blood glucose, and insulin levels in the obese dogs at 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14 weeks after the operation There was a very prominent decrease in average body weight, cholesterol, triglyceride, blood glucose, and insulin levels, with statistically significant differences at a significant level (.05) after operation when compared with fixed test average values. After the operation, it was evident that all the variables had decreased and had been corrected for the better.

KEY WORDS: sleeve gastrectomy, body weight, cholesterol, triglyceride, blood glucose, insulin levels.

INTRODUCTION

Obesity is defined as excessive body fat accumulation. It is a chronic disease (Santos *et al.*, 2015). The prevalence of obesity in domestic canine populations has been reported to range from 23% to 41%. Knowledge of obesity as a risk factor for disease can heighten awareness and target health screening of dogs (Lund *et al.*, 2006). Obesity is a common problem in dogs (German, 2006). Numerous studies in developed countries suggest that between 25% and 40% of adult dogs are overweight or obese. The incidence of obese dogs has recently been estimated to

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be between 20 and 40%, and there is an increasing trend in the incidence of obesity in the pet population (McGreevy *et al.*, 2005). Early recognition of the pathophysiology of obesity with its metabolic alterations and correlates is essential in the management of obese animals (German, 2006). Bariatric surgery, which aims to promote weight loss by either reducing stomach size or bypassing a portion of the intestine, is associated with effective long-term weight loss and beneficial metabolic sequelae (Colquitt et al., 2009). Bariatric surgery includes a variety of procedures performed on dogs that are obese (Rai et al., 2014). Metabolic correction, weight loss, and improvement in quality of life have been reported following bariatric surgery (Kiong et al., 2010). Sleeve gastrectomy involves the creation of a narrow gastric tube through excision of the body of the stomach by resection of the greater curvature of the stomach and preservation of the pyloric valve and gastro-esophageal junction (Pories, 2008; Melissas et al., 2007). Sleeve gastrectomy is one of the most commonly performed bariatric surgery procedures (Himpens, 2006). Weighing is still useful for monitoring changes and a gain in weight may be an indication of excess weight and should prompt an assessed body condition (Laflamme, 1997). Weight loss after sleeve gastrectomy is partly based on a gastric restrictive mechanism tubulisation which reduces the size of the new stomach.The sleeve gastrectomy also has a hormonal effect. By removing the gastric fundus, the secretion of ghrelin, a hormone that stimulates appetite secreted by fundic parietal cells, is almost stopped, causing loss of appetite (Ikramuddin and Buchwald, 2011). The body requires the monosaccharide glucose as an energy source and as a basic material for the creation of proteins and lipids. Most cells use glucose as the main energy source. For an animal to be healthy, blood glucose levels must be within a normal range (Johnson, 2008). Because glucose is less glycated with proteins than other monosaccharides, it is probably the most common natural monosaccharide (Jeremy, 2017). All animals have the capacity to make glucose on demand from specific precursors. (Peter, 2014). The most prevalent form of fat in the body is triglycerides (Nelson and Cox, 2000). Excess calories from dogs' meals are converted to triglycerides and stored as fat (Grundy et al., 2004). The main sterol in animal tissues is cholesterol. It is a soft, high-fat substance that is really found in all of the body's cells and the bloodstream (Rifai et al., 1999). All the cholesterol that the body requires is already available. (Jama, 2001). All animal life requires cholesterol, and each cell has the ability to produce it. The body also reduces the production of its own cholesterol to make up for the absorption of dietary cholesterol (Lecerf and de Lorgeril, 2011).

MATERIAL AND METHOD

Animal management and preparation

A total of 16 obese dogs were purchased from the market. Experiment animals were placed in separate cages at room temperature, under natural light conditions, and given a high-protein, high-fat diet with free access to water. The dogs were fed a high-calorie diet for three months, which was enough time to make obese dogs. A standard diet with the inclusion of butter and animal fat (fat made up 20% of the diet) became the diet of obese dogs. Twelve-month-old dogs (25 kg bw) were weighed. Experimental animals are handled and monitored using the Lane and Cooper method (2003). We shaved and disinfected the site of surgery with alcohol. The sterilization technique was used to prepare the injection site for anesthesia.

Experimental protocol

On the day of the surgery, the surgeon's hands and arms were scrubbed with a brush and antiseptic soap. After that, they put on the surgeon's kit (cap, mask, and surgical gown). After an overnight 12-h fast, dogs were pre-medicated with intramuscular (I/M) xylazine 1 mg/kg. Ketamine at a dose of 10 mg/kg was used to provide general anesthesia (Lker et al., 2013). All surgeries were performed under sterile conditions. Obese dogs were lying on their backs supine . The abdomen was washed thoroughly with sterile skin preparation with povidone iodine or alcohol (Al-Wadani et al., 2017). The operation was performed at the linea ulba through a 10-cm-long midline incision. Subcutaneous fat is a major obstacle in weight-loss surgery. The first step in the procedure is to divide the vascular supply into a greater curvature of the stomach. This is followed by a longitudinal gastrectomy, which "gags" the stomach to make it smaller into a narrow tube. In this way, the continuity of the stomach was preserved and the greater curvature area of the stomach was eliminated. More than 70–80% of the stomach has been removed without any significant loss of organ function. The stomach tube (5 cm in diameter) was sutured back together by a double layer of lambert using cut gut. The stomachs (5 cm in diameter) were sutured together in layers. Non-absorbable sutures close the skin incision. All experimental animals were wearing Elithabithan collars after the procedure. The animals were given the analgesic Novasul (Richter pharma, Wels, Austria), 2 mL/animal, i/v, after surgery. And the antibiotic Biocillin 150 LA (Inter-cheme, Holland) 2 mL/animals, i.m. Following surgery, food and water restrictions were implemented while dogs received Ringer-Lactate solution for three consecutive days, with a balanced soft and/or syrupy diet supplemented with minerals and vitamins. Postoperatively, we estimated the body weight of obese dogs under study, and blood samples were collected from the cephalic vein of obese dogs. All samples were evaluated on the same day. Plasma was recovered by centrifugation at 1500g for 10 min at 4°C and subsequently stored at 25°C. Biochemical characteristics (blood glucose mg/dl, cholestrol mg/dl, trigelceride mg/dl) were measured and the concentration of hormones in blood plasma insulin (ng/ml) in experimental animals at 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14 weeks after operation.

Statistical analysis:

Data were shown as mean ± SD. One sample t. test was used to compare body weight, Cholesterol, trigelceride, blood glucoose and hormones insulin levels with fixed test average. The results were considered statistically significant for $p \leq 0.05$.

RESULT

Table 1. It was confirmed that there is a significant difference in body weight for obese dogs after the operation, as by conducting a t-test for one sample, it was found that the average body weight is equal to (13.85 ± 0.1) with a probability value of (0.00), which is less than the significance level of.05, which indicates that there is a significant difference in body weight after the operation in comparison with the fixed value of body weight for obese dogs. These results are illustrated in figure No. (1).

Table 2. It was confirmed that there is a significant difference in cholestrol for obese dogs after the operation, as by conducting a t-test for one sample, it was found that the average cholestrol is equal to (209.32 ± 27.3) with a probability value equal to (0.00), which is less than the significance level of.05, which indicates that there is a significant difference in cholestrol after the operation in comparison with the fixed value of cholestrol for obese dogs. See also table 2. It is shown that there is a

significant difference in trigelceride for obese dogs after the operation, as by conducting a t-test for one sample, it was found that the average trigelceride is equal to (89.8 ± 2.9) with a probability value equal to (0.00), which is less than the significance level of.05, which indicates that there is a significant difference in trigelceride after the operation in comparison with the fixed value of trigelceride for obese dogs. Table (2) results are illustrated in figure (2).

According to Table 3, it was confirmed that there is a significant difference in blood glucose for obese dogs after the operation, as by conducting a t-test for one sample, it was found that the average blood glucose is equal to (91.53 ± 0.4) with a probability value equal to (0.00), which is less than the significance level of.05, which indicates that there is a significant difference in blood glucose after the operation in comparison with the fixed value of blood glucose for obese dogs. On the other hand, from table 3, it is clear that there is a significant difference in insulin level for obese dogs after an operation, as by conducting a t-test for one sample, it was found that the average insulin level is equal to (119.07 ± 1.6) with a probability value equal to (0.00), which is less than the significance level of 0.05, which indicates that there is a significant difference in insulin level after the operation in comparison with the fixed value of insulin level for obese dogs. These results are illustrated in figure (3).

DISSCUTION

As a result, the ideal operation must have low short-and long-term morbidity and mortality risks, produce significant and long-term weight loss, and maintain normal gastrointestinal function (Iannelli et al., 2008; Cottam et al., 2006). In recent studies, sleeve gastrectomy is performed to create a narrow gastric tube that decreases gastric size and causes an early sensation of satiety that leads to diminished food intake. We selected the dog as our experimental subject since there are physiological and anatomical similarities between the foreguts of dogs and humans. After the operation, obese dogs achieved a significant decrease in food intake.

In table 1, after sleeve gastrectomy, we confirmed that there is a decrease in body weight, which, in comparison with the fixed value of body weight for obese dogs, These results were obtained by Hamoui et al. (2006) and Tuker et al. (2008).

From table 2. Postoperatively, we confirmed that there was a decrease in cholesterol, which, in comparison with the fixed value of cholesterol for obese dogs, is remarkable. This is an agreement by Forster et al. (2018). Also in Table 2. We confirmed that there is a decrease in trigelceride after surgery, which, when compared to the fixed value of trigelceride for obese dogs, is significant. These results were obtained by Korner et al., 2009.

To discuss the results from table 3. After the operation, we found a decrease in blood glucose, which, in comparison with the fixed value of blood glucose for obese dogs, was unexpected. These results were obtained by Dirksen et al. (2012). In Table 3, postoperatively, we noticed a decrease in insulin level in comparison with the fixed value of insulin level for obese dogs. This result was reported along with that found by Martin et al. (2006).

CONCLUSION

In conclusion, this study set out to evaluate body weight, cholesterol, trigelceride, blood glucose and insulin level in obese dogs under study after sleeve gastrectomy. This study has shown that a significant decrease in average in body weight, cholesterol, trigelceride, blood glucose and insulin level postoperatively. From the above results, we can conclude that sleeve gastrectomy had a safe and effective results in bariatric surgery.

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Table 1. Effect of sleeve gastrectomy on body weight:

Groups	Average	P value
Test average	20.64 ± 0.2	0.00
Sleeve gastrectomy	13.85 ± 0.1	0.00

*Average= Mean±SD. * Statistical significance p≤ .05.

Table 2: Effect of sleeve gastrectomy on cholesterol and trigelceride.

Groups		Average	P - value
CHO (mg/dl)	*Test average*	303.3±77.1	0.00
	Sleeve gastrectomy	209.3±27.3	0.00
TG (mg/dl)	*Test average*	133.6 ± 13.2	0.00
	Sleeve gastrectomy	89.8 ± 2.9	0.00

*Average= Mean±SD. * CHO: cholesterol. * TG: trigelceride.
* Statistical significance p≤ .05.

Table 3. Effect of sleeve gastrectomy on body blood glucose and insulin level.

Groups		Average	P value
BG (mg/dl)	*Test average*	121.2 ± 2.5	0.00
	Sleeve gastrectomy	91.5± 0.4	0.00
INS (ng/ml)	*Test average*	201.9 ± 4.2	0.00
	Sleeve gastrectomy	119.1± 1.6	0.00

*Average= Mean±SD. * BG: blood glucose. * INS: insulin.
* Statistical significance p≤ .05.

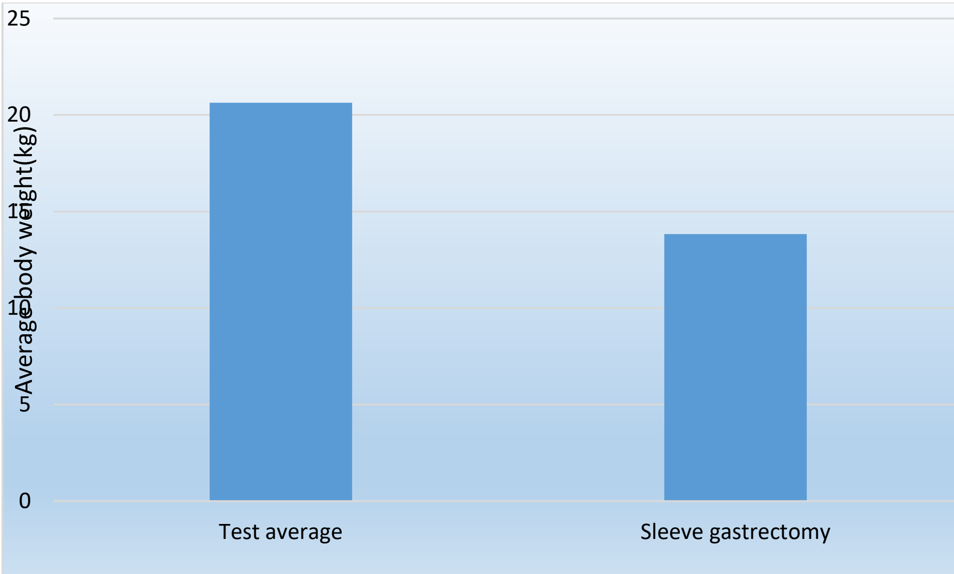

Fig 1. Effect of sleeve gastrectomy on body weight.

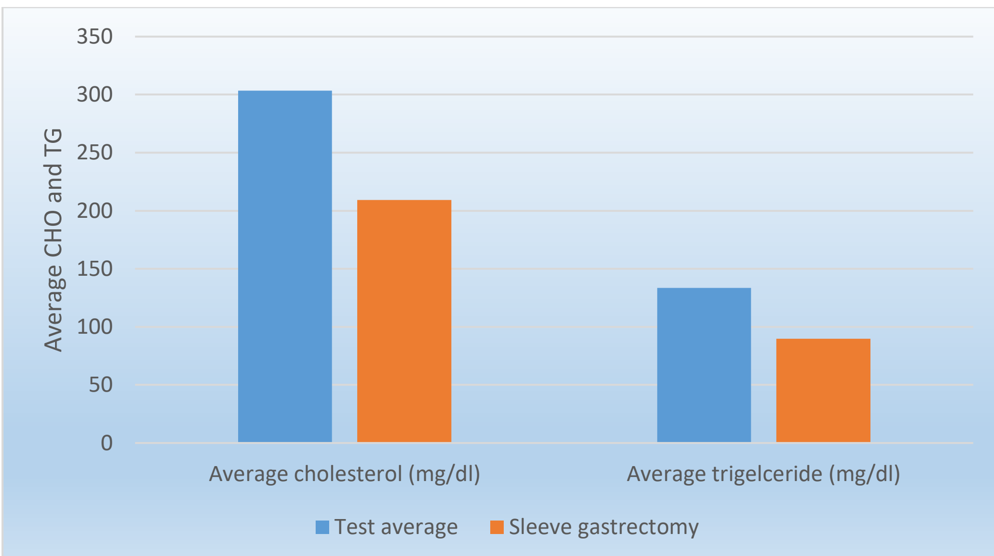

Fig 2. Effect of sleeve gastrectomy on cholestrol and trigelceride.

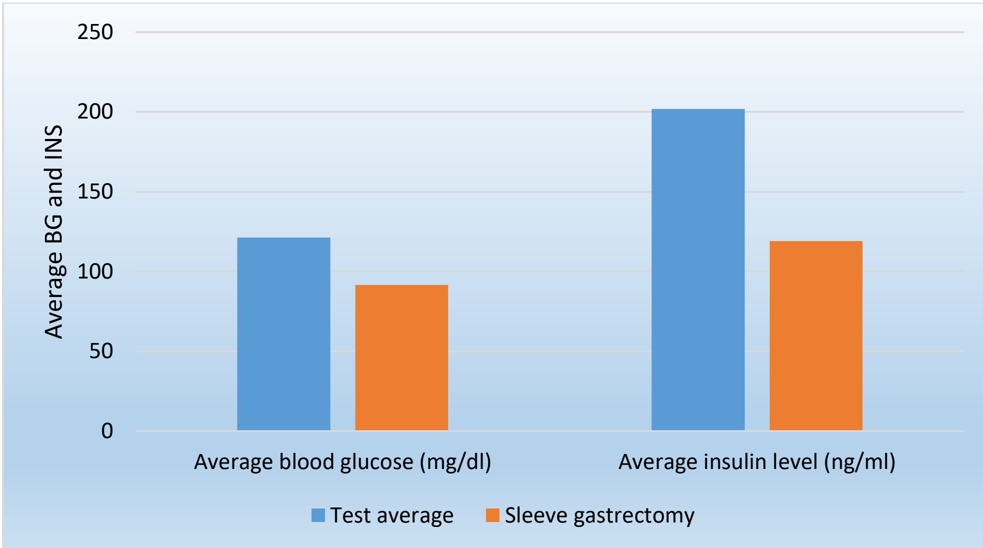

Fig 3. Effect of sleeve gastrectomy on blood glucose and insulin levels.

REFERANCE

Al-Wadani et al (2017). Weight Loss Ther, 7:3. and benefits. J. Obes Reprod Dom Anim 44(Suppl 2), 29–35.

Colquitt J L Picot J E and Loveman A J (2009). Clegg Surgery for obesity Cochrane Database Syst. Rev., 15 (2), p. CD003641.

Cottam D. Qureshi F G and Mattar S G et al. (2006). Laparoscopic sleeve gastrectomy as an initial weight-loss procedure for high-risk patients with morbid obesity. Surg Endosc. 20:859–63.

Dirksen C. Jorgensen N B and Bojsen-Moller K N et al (2012). Mechanisms of improved glycaemic control after Roux-en-Y gastric bypass. Diabetologia. 55:1890–901. Forster G M. Stockman J. Noyes N. Heuberger A L. Broeckling C D. Bantle C M., Ryan E P (2018). A comparative study of serum biochemistry, metabolome and microbiome parameters of clinically healthy, normal weight, overweight, and obese companion dogs, Topics in Companion Animal Medicine, pp. 1-10.

German A J (2006). The growing problem of obesity in dogs and cats. J Nutr. 2006; 136: 1940S±1946S. PMID. 16772464.

Grundy S M e t a l. (2004). Circulation, 110 (2):227-239.

Hamoui N. Anthone G J. Kaufman H S and Crookes P F (2006). Sleeve gastrectomy in the high-risk patient. ObesSurg 16: 1445-1449.

Himpens J. Dapri G and Cadiere G B (2006). A prospective randomized study between laparoscopic gastric banding and laparoscopic isolated sleeve gastrectomy: results after 1 and 3 years. Obes Surg 16:1450–1456.

Ikramuddin S and Buchwald H (2011). How bariatric and metabolic operations control metabolic syndrome. Br J Surg 98: 1339-1341.

Ilker C. Nihat S. Güzin O. Hüdai İ. Halil S B and Tekin S (2013). Effect of Ketamine-Xylazine Anesthesia on Some Hematological and Serum Biochemical Values of Bozova Greyhounds. Harran Üniv Vet Fak Derg, 2(1) 27-31.

Jama (2001). Evaluation, and Treatment of High Blood Cholesterol in Adults; 285(19):2486-2497.

Jeremy M B (2017). Stryer Biochemie. Springer-Verlag, 2017, ISBN 978-3-662-54620-8, p. 531. (german).

Johnson C A (2008). Glucose homeostasis during pregnancy: Insulin Resistance, ketosis, and hypoglycemia. Theriogenology 70, 1418 -1423.

Kiong K L. Ganesh R. Cheng A K S. Lekshiminarayanan R and Lim S C (2010). Early improvement in type 2 diabetes mellitus post Roux-en- Y gastric bypass in Asian patients, Singapore Med J 51: 937-943.

Korner J. Inabnet W. Febres G. Conwell I M and McMahon D J et al (2009). Prospective study of gut hormone and metabolic changes Aieradjustable gastric banding and Roux-en-Y gastric bypass. Int J Obes (Lond) 33: 786-795.

Laflamme, D. R. (1997). "Development and validation of a body condition score system for dogs". Canine Practice. 22 (4): 10–15.

Lane, D. R. and Cooper, B. (2003). Veterinary nursing. Third edition. Published by British library. 1-10.

Lannelli A. Dainese R and Piche T., et al (2008). Laparoscopic sleeve gastrectomy for morbid obesity. World J Gastroenterol.;14:82.

Lecerf J M and de Lorgeril M (2011). "Dietary cholesterol: from physiology to cardiovascular risk". The British Journal of Nutrition. 106 (1): 6–14. doi:10.1017/S0007114511000237. PMID 21385506.

Lund E M. Armstrong P. Kirk C. and Klausner J (2006). Prevalence and Risk Factors for Obesity in Adult Dogs from Private US Veterinary Practices. International Journal of Applied Research in Veterinary Medicine, 3(2), 177–186.

Martin L J M., Siliart B., Dumon H J W and Nguyen P G (2005). Hormonal disturbances associated with obesity in dogs. Unite ´ de Nutrition et Endocrinologie, Ecole Nationale Ve´te ´rinaire, BP 40706 F-44307 Nantes, France.

McGreevy P D. Thomson P C and Price C et al (2005). Prevalence of obesity in dogs examined byAustralian veterinary practices and the risk factors involved. Vet Rec. 156: 695–702.

Melissas J. Koukouraki S. and Askoxylakis J et al. (2007). Sleeve gastrectomy: a restrictive procedure? ObesSurg. 17:57—62.

Nelson D L and Cox M M (2000). Lehninger, Principles of Biochemistry (3rd ed.). New York: Worth Publishing. ISBN 1-57259-153-6.

Peter, C. H. (2014). Löffler/Petrides Biochemie und Pathobiochemie. Springer-Verlag, ISBN 978-3-642-17972-3, p. 195.

Pories W J. Clin J and Metab E (2008). Bariatric surgery: risks and rewards.; 93(11 Suppl 1):S89–96.
Rai S. Shakya A. and Bilwar H (2014). obesity and its management in dogs. Indo-Am. J. Agric. & Vet. Sci., Vol. 2, No. 4.
Rifai N. Bachorik P S and Albers J J (1999). Lipids, lipoproteins, and apolipoproteins.In: Burtis, C.A., Ashwood, E.R. (Eds.), Tietz Textbook Of Clinical Chemistry. WB Saunders, Philadelphia, Pennsylvania, pp. 809–861.
Santos T D. Burgos M G A. Lemos M C C and Cabral P C (2015). Clinical and nutritional aspects in obese women during the first year after roux-en-y gastric bypass. Arq Bras Cir Dig. 2015; 28(Suppl 1):56-60.
Tucker O N. Szomstein S. and Rosenthal R J (2008). Indications for sleeve gastrectomy as a primary procedure for weight loss in the morbidly obese. J GastrointestSurg 12: 662-667.