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Evaluation of Complications, Cholesterol and Triglyceride in Blood after Sleeve Gastrectomy in Castrated, Non- Castrated Obese Dogs

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A B S T R A C T

In the present study evaluated sleeve gastrectomy as bariatric intervention in castrated, non-castrated obese dogs by estimating biochemical characteristics in the blood and complications after an operation. Twenty obese dogs (10 castrated and 10 non-castrated) were subjected to open sleeve gastrectomy. The complications were inspected, observed and registered on days 1, 3, 7, 10, 14, 21, 30 after sleeve gastrectomy per day. Estimated biochemical characteristics (cholesterol and trigelcrides) in castrated, non-castrated obese dogs at 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 weeks after operation. After sleeve gastrectomy, complications were more obvious in castrated obese dogs than non-castrated obese dogs. Post operation, the average cholesterol and triglyceride in the blood are higher in castrated obese dogs than in non-castrated obese dogs, with no statistically significant differences at a significant level (.05). No significant difference was observed between the average cholesterol and triglycerides in the blood after sleeve gastrectomy in obese castrated and non-castrated dogs. It was very clear that there was an increase in the complications of sleeve gastrectomy in castrated obese dogs compared to non-castrated obese dogs.

Introduction

Obesity is defined as excessive body fat accumulation. It is a chronic disease caused by multiple factors which may seriously harm the health of individuals (Santos *et al.*, 2015). The veterinary profession now recognizes obesity to be the most important medical disease in dogs, with published studies suggesting that 34-59% of dogs are either overweight or obese (Mcgreevy *et al.*, 2005 and Colliard *et al.*, 2006).

Bariatric surgery, also known as weight-loss surgery or obesity surgery, is widely accepted as the only known effective treatment for severe obesity (Sjostrom *et al.*, 1999). Sleeve gastrectomy involves

creation of a narrow gastric tube through excision of the body of the stomach (Pories and Metab, 2008). Sleeve gastrectomy is now one of the most commonly performed bariatric surgery procedures (Himpens, 2006). Complications of sleeve gastrectomy include problems such as infection, leaks, postoperative hemorrhage, prolonged vomiting, sub-phrenic abscess, death (Andrew *et al.*, 2007).

Castration in male dogs is commonly accomplished by surgically removing the testicles, though there are a variety of surgical techniques as well as non-surgical methods of contraception to prevent reproduction without removing the source of gonadal hormones (Howe, 2006; Kutzler and Wood 2006).

Cholesterol is a soft, fat-like substance found in the bloodstream and in all the body's cells. The body has all the cholesterol it needs. The saturated and trans fats the dog eats may raise blood cholesterol levels.

Having too much cholesterol in the blood may lead to an increased risk for heart disease and stroke (Shak *et al.*, 2001). Triglycerides are a great source of energy. Triglycerides come from certain foods, and they are produced naturally in the body by the liver. When the dog eats, calories that are not used as energy are converted into triglycerides and stored as fat. Although triglycerides are important for your body's healthy functioning, they may be dangerous in high amounts, increasing risk for cardiovascular (heart) disease and pancreatitis (inflammation, or swelling, of the pancreas) (Grundy *et al.*, 2004).

Materials and Methods

Animals

The Local Ethical Committee approved the animal studies. 20 male obese dogs (10 castrated and 10 non-castrated) were used in the present study at the college of veterinary medicine at Sudan University of Science and Technology (SUST).

Animal preparation for surgery procedures

The experimental animals were kept in separate cages at room temperature, natural lighting conditions, and free access to water, maintained on a high protein and carbohydrate diet. After arrival, dogs are fed on a high caloric diet for three months, time sufficient to obtain obese dogs. The diet consisted of a standard diet with the inclusion of butter and tallow (fat consisted of 20% diet). 1-year-old dogs (25 kg of body weight) were weighted. Fasted overnight and divided into two groups (10 castrated obese dogs and 10 non-castrated obese dogs). Handling and controlling of experimental animals by using the method of lane and Cooper (2003). On the day of surgery, the site of operation was clipped, shaved and disinfected with alcohol, the site of injecting the anesthesia prepared using techniques.

Experimental protocol

Dogs were Pre-medicated with intramuscular (I/M) xylazine 1mg/kg. Ketamine in 10mg/kg was used as general anesthesia (İlker *et al.*, 2013). The animals were laid down in a supine position. The abdomen was washed thoroughly; sterile skin preparation with povidone iodine or alcohol (Al-Wadani *et al.*, 2017). The site of operation was carried out at the linea ulba a midline incision 10 cm long. The stomach tube (5 cm in diameter) was sutured back together by a double layer of lamberts, using cut gut. In this fashion, gastric continuity was maintained and the greater curvature region of the stomach eliminated (Plate1). The transacted stomach, which includes the greater curvature, is completely removed (plate 2). Up to 70 – 80% of the stomach is removed without any major loss of organ function. Nylon sutures closed the skin incision. The dogs were hospitalized after the operation until proper healing. Painkillers will be administered (Flunxicin melgeomine). Following surgery, food and water restrictions were implemented while dogs received Ringer-Lactate solution for three days subsequent with the balanced soft and/or syrupy diet supplemented with minerals and vitamins.

Operations were clinically inspected by surgeons thereafter; evidence of infection, postoperative hemorrhage, leaks, prolonged vomiting, sub-phrenic abscess, death, were observed and registered on day 1, 3, 7, 10, 14, 21, 30. Postoperatively, blood samples are collected from the forelimb vein of dogs and collected into heparinized plastic tubes. Plasma recovered by centrifugation at 1200g for 5 min at 4°C and subsequently stored at −25°C until used to estimate biochemical characteristics (cholesterol and trigelcrides) in castrated, non-castrated obese dogs on 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 weeks after operation.

Statistical analysis

Results are presented as mean, standard deviation. Statistical significance was determined by an independent sample t-test. The significance level was set at $P \leq 0.05$.

Facility requirements

Main facilities are available in the college of veterinary medicine. At the Sudan University of Science and Technology, the research paper was sponsored by the college of Research Committee at the same university.

Results and Discussion

In table 1, infection after sleeve gastrectomy was noticed in two castrated obese dogs (10%) and in one non-castrated obese dog (5%). Three-castrated obese dogs (15%) developed postoperative hemorrhage and also noticed two non-castrated obese dogs (10%) had post-operative hemorrhage.

Leaks were observed in three castrated obese dogs (15%) and two non- castrated obese dogs (10%) after an operation. Prolonged vomiting was observed commonly after a sleeve gastrectomy operation in three castrated obese dogs (15%) and noticed in two non-castrated obese dogs (10%), after which time, the vomiting resolved spontaneously. Sub phrenic abscess was noticed in one castrated obese dog (5%) and one non-castrated obese dog (5%) after surgery. The death of an animal after an operation was noticed in two castrated obese dogs (10%) and two non-castrated obese dogs (10%).

To verify the hypothesis that there are statistically significant differences between average cholesterol and triglyceride in castrated and non–castrated obese dogs, we conducted a t-test for independent samples and after conforming and conditions, the results were as follows:

It is clear from the data of Table No. (2) that the average cholesterol in castrated obese dogs after sleeve gastrectomy is (214.0054) mg/dl with a standard deviation of (29.46874), which is higher than the average cholesterol in non-castrated obese dogs which is equal to (205.2411) mg/dl with a standard deviation of (30.15679) with a probability value (.889) is greater than the significance level (.05), and accordingly we decide that there are no statistically significant differences at the significance level (.05) between the average cholesterol in castrated and non-castrated obese dogs.

From the data of Table No. (2), the average triglyceride represented a significant decrease in obese castrated dogs after sleeve gastrectomy, is (94.3268) mg/dl with a standard deviation of (16.08585), but higher than the average triglyceride in non-castrated obese dogs which is equal to (86.2750) mg/dl with a standard deviation of (13.64979) with a probability value (.960) is greater than the significance level (.05), and accordingly we decide that there are no statistically significant differences found in average triglyceride between castrated, non-castrated obese dogs.

During the observation of the complications of sleeve gastrectomy in castrated, non-castrated obese dogs, the infection after sleeve gastrectomy showed in two castrated obese dogs (10%). These results are in agreement with those obtained by (Falagas and Kompoti, 2006). One non-castrated obese dog (5%) showed infection after an operation.

Table.1 Comparison of complications sleeve gastrectomy in each group by observation and registration after operation (percentage).

Complications	Number of sample	Sleeve gastrectomy			
		Castrated dogs		Non Castrated dogs	
		N	%	N	%
Infection	20	2	10	1	5
Postoperative hemorrhage	20	3	15	2	10
Leaks	20	3	15	2	10
Prolonged vomiting	20	3	15	2	10
Sub phrenic abscess	20	1	5	1	5
Death	20	2	10	2	10

Table.2 T-test results for the difference between average cholesterol and triglyceride according to the two groups.

	Treatments	N	Mean	Std. Deviation	T value	Sig	Statistical significance
CHO (mg/dl)	group a	112	214.0054	29.46874	2.200	.889	**ns**
	group b	112	205.2411	30.15679			
TG (mg/dl)	group a	112	94.3268	16.08585	4.039	.960	**ns**
	group b	112	86.2750	13.64979			

*group (a, b) ns: not significant*group a: neutered dogs.*group b: non-castrated dogs.* CHO: cholesterol.*TG: triglyceride.

Plate.1 The dog's stomach before (A) and after (B) remove greater curvature.

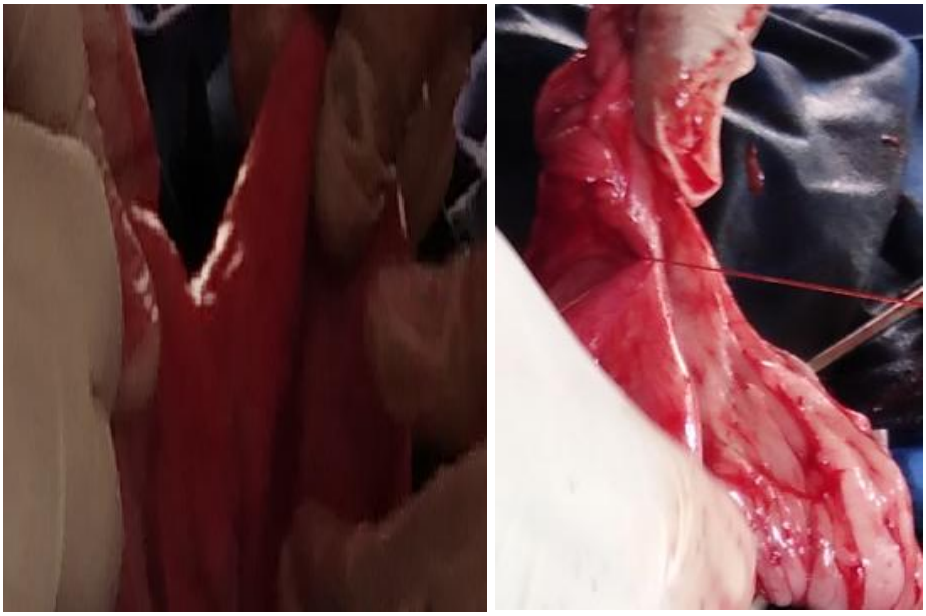

Plate.2 Transacted stomach after sleeve gastractomy.

These results agreed with the findings of Helmio *et al.,* (2012), which reported a lower percentage of infection. Postoperative hemorrhage was noticed in three (15%) castrated obese dogs. These results are in agreement with those obtained by Shi *et al.,* (2010). In addition, two non-castrated obese dogs (10%) showed postoperative hemorrhages. Our results agreed with previous reports regarding postoperative hemorrhage. Verhaeghe *et al.,* (2008).After the operation, three castrated obese dogs (15%) had leaks. However, many studies have reported that leaks after operations (Fuks *et al.,* 2009; Chen *et al.,* 2009).

Leaks were observed in two non-castrated obese dogs (10%), which agreed with Rosenthal *et al.,* (2012). Prolonged vomiting was observed in three castrated obese dogs (15%). This result was agreed with (Cottam *et al.,* 2003). Two non-castrated obese dogs (10%) had prolonged vomiting, which agreed with the conclusion in the report (Halliday *et al.,* 2017). Sub-phrenic abscesses were also observed commonly after sleeve gastrectomy in one-castrated obese dogs (5%). Our results were agreed with previous studies (Falagas and Kompoti, 2006). Sub phrenic abscess was noticed in one non-castrated obese dog (5%)-these results agreed with previous studies (Sjostrom *et al.,* 2004). The current study found that death was noticed in two castrated obese dogs (10%). These results seem to be consistent with other research which was found by (Flum *et al.,* 2005). Results of this study showed that the death in two non-castrated obese dogs (10%). These results were obtained by Shi *et al.,* (2010).

After the operation, this study found a decrease in average cholesterol in non-castrated obese dogs. These results seem to be consistent with other research which we found (Diez *et al.,* 2004; Jeusette *et al.,* 2005). The results of this study show that lower average cholesterol in castrated obese dogs after sleeve gastrectomy. So we find that there is no significant difference in the average cholesterol of obese non-neutered dogs. These results are in agreement with those obtained by (Chikamune *et al.,* 1995; Bailhache *et al.,* 2003; Jeusette *et al.,* 2005).

The current study showed that low average triglyceride in castrated obese dogs. This result is consistent with that found by Videl *et al.,* (2008). According to the results of this study, we found a decrease in the average triglycerides of obese non-

neutered dogs in line with that obtained by Kashyap *et al.,* (2003).

The aim of the present research was to evaluate sleeve gastrectomy in castrated, non-castrated obese dogs. From the above results, we can conclude that sleeve gastrectomy had more complications in castrated obese dogs than non-castrated obese dogs, with no significant difference in average cholesterol and triglycerides between both groups.

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