

Renal function improvement in the patients who had sleeve gastrectomy.

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Abstract

Aim: The aim of our study was to investigate the changes in renal functions as well as body mass index and lipid profiles of morbid obese patients that underwent Sleeve Gastrectomy (SG) by comparing them with patients that received Balloon Gastroplasty (BG) treatment.

Materials and method: This is a retrospective study. For preoperative and postoperative periods (between 4 and 5 months), the parameters related to patients' fasting blood sugar and insulin, lipid profile, Body Mass Index (BMI), liver function tests and Creatinine (Cr) were recorded, and Glomerular Filtration Rate (GFR) values were calculated according to MDRD (Modification of Diet in Renal Disease Study) and CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration) formulations.

Results: Groups were similar according to age, baseline creatinine, CKD-EPI and MDRD levels and BMI values. With regard to renal function, there was a significant decrease in Cr values and significant increases in CKD-EPI and MDRD levels in this group of patients (p values; 0.010, 0.022, 0.029, respectively). There was no significant difference between preoperative and postoperative Cr, CKD-EPI and MDRD values of patients that underwent balloon gastroplasty (p values; 0.421, 0.581, 0.316 respectively).

Discussion: Obesity is a risk factor for chronic kidney disease. Abnormal kidney functions are seen more commonly in morbid obese patients. SG enables weight loss, and thus contributes to the improvement of renal functions.

Keywords: Obesity, Renal function, Sleeve gastrectomy.

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Introduction

Obesity is a pandemic multifunctional disorder that affects several systems. Many methods, including pharmacological, non-pharmacological and surgical ones, have been used for its treatment [1,2]. In obese patients, weight loss reduces the risk of type 2 diabetes mellitus, hypertension, dyslipidemia and coronary artery disease. The risk of mortality and morbidity increases with the increase in body mass index.

The effects of dietary changes, pharmacological treatment and changes in life style are limited in morbid obese patients; that is why bariatric surgery, particularly sleeve gastrectomy, should be considered an option in patients with weight loss resistance [3-5].

The impacts of sleeve gastrectomy on blood sugar, lipid values and insulin resistance have been known. Nevertheless, so far, little has been elucidated about its effects on renal functions. The aim of this paper is to investigate the changes, in a period of four and a half months, in renal functions as well as BMI and cholesterol of morbid obese patients that underwent SG without any known additional chronic diseases by comparing them with patients that received BG treatment.

Materials and Methods

This study is based on a retrospective design. The participants of this study were the patients that underwent sleeve gastrectomy according to obesity diagnosis and treatment guidelines of the Turkish Society of Endocrinology and Metabolism, with a BMI of 40 and over and without any known chronic disease.

The information on the patients' age, gender and educational background was received from their file. For preoperative and postoperative periods (between 4 and 5 months), the parameters related to patients' fasting blood sugar and insulin, lipid profile, BMI, liver function tests and Cr were recorded, and GFR values were calculated according to MDRD (Modification of Diet in Renal Disease Study) and CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration) formulations [6,7].

Statistical analysis

Continuous data were defined in the form of mean \pm standard deviation. Categorical data were defined as percentages. The Shapiro-Wilk test was used to check whether the data were normally distributed. The Mann-Whitney U test was used to compare pair groups for continuous data that were not

distributed normally. The ttest was used to compare pair groups for continuous data that were normally distributed. Chisquare test was performed to analyze the cross tables. The Wilcoxon test was used to compare the values obtained in different measurements when there were two groups. IBM SPSS Statistics 21.0 (SPSS Inc., Chicago, IL) was used for the analysis. P <0.05 was taken as a criterion for statistical significance.

Results

The data were collected retrospectively from the patients operated in the general surgery department of Yunus Emre State Hospital in Eskişehir, Turkey (2013-2015). CKD-EPI and MDRD formulations were used to calculate retrospectively the GFR of patients before and after the operation. GFR values of the two groups were compared. The study was conducted with a total of 51 patients, i.e. 14 patients (7 men and 7 women) that underwent balloon gastroplasty and 31 patients (6 men and 31 women) that underwent sleeve gastrectomy. Groups were similar according to age, baseline creatinine, CKD and MDRD levels and BMI values (p values were; 0.304, 0.288, 0.965, 0.468, 0.473 respectively) (Summarized in table 1).

Table 1. Comparison of BG and SG groups.

Category	OPERATION	Percentiles			p values
		25	50	75	
AGE (years)	BG	30.5	46.5	522500	0.304

Table 2. Comparison of study groups according to pre and post-operation values.

	BG			p	SG		
	Pre-op	Post-op			Pre-op	Post-op	p
Cr (mg/dl)	0.88 ± 0.18 0.84 (0.79-0.99)	0.85 ± 0.16 0.84 (0.74-0.94)	0.421*	0.85 ± 0.13 0.81 (0.75-0.94)	0.80 ± 0.12 0.78 (0.73-0.87)	0.010*	
CKD-EPI (ml/dl)	91.55 ± 18.09 94.00 (77.00-102.00)	93.82 ± 24.64 83.00 (74.00-117.00)	0.581*	92.78 ± 14.30 93.00 (80.00-103.50)	97.86 ± 14.03 99.00 (88.50 - 108.00)	0.022*	
MDRD (ml/dl)	87.55 ± 17.41 87.00 (73.00-97.00)	93.27 ± 28.28 78.00 (73.00-112.00)	0.316*	86.00 ± 13.60 86.00 (74.50-95.00)	90.97 ± 14.10 90.00 (82.50 - 100.00)	0.029*	
BMI (kg/m ²)	47.31 ± 6.59 44.00 (41.80-56.70)	42.21 ± 6.25 39.26 (36.89-51.99)	<0.001*	45.56 ± 4.87 44.10 (41.85-46.90)	37.96 ± 5.52 35.96 (34.67-39.79)	<0.001**	
TC (mg/dl)	208.45 ± 32.22 207.00 (186.00-235.00)	187.36 ± 35.32 197.00 (147.00-209.00)	0.045*	200.05 ± 33.04 201.00 (178.00-216.50)	187.08 ± 37.84 191.00 (162.00-201.50)	0.003*	
HDL (mg/dl)	45.18 ± 8.77 45.00 (39.00-51.00)	44.09 ± 6.17 42.00 (41.00-48.00)	0.684*	44.22 ± 9.31 43.00 (39.50-47.00)	46.38 ± 7.78 46.00 (40.50-51.50)	0.057*	
LDL (mg/dl)	129.82 ± 30.08 136.00 (98.00-157.00)	117.64 ± 34.26 121.00 (91.00-141.00)	0.163*	123.05 ± 32.19 125.00 (104.50-140.50)	118.57 ± 33.91 120.00 (95.00 - 133.00)	0.295*	
TG (mg/dl)	164.82 ± 68.82 164.00 (98.00-203.00)	127.45 ± 38.88 121.00 (100.00-163.00)	0.116*	166.38 ± 97.10 142.00 (105.00-177.00)	110.38 ± 42.07 102.00 (83.50 - 127.00)	0.001**	
FPG (mg/dl)	116.55 ± 46.82	109.55 ± 35.00	0.198*	116.19 ± 65.69	98.11 ± 39.13	<0.001**	

	SG	31	390000	450000	
Cr (mg/dL)	BG	0.782	0.855	1.012	0.288
	SG	0.75	0.81	0.94	
CKD (ml/min)	BG	78.5	92.5	104	0.965
	SG	80	93	103.5	
MDRD (ml/min)	BG	74.5	87	100.75	0.468
	SG	74.5	86	95	
BMI (kg/m ²)	BG	41.95	45150	51.675	0.473
	SG	41.85	44.1	46.9	

The results suggest that there was a significant difference between preoperative and postoperative Total Cholesterol (TC), BMI, Triglyceride (TG), Fasting Plasma Glucose (FPG), Aspartate Transaminase (AST) and Alanine Transaminase (ALT) values of patients that underwent SG. With regard to renal function, there was a significant decrease in Cr values and significant increases in CKD-EPI and MDRD levels in this group of patients (p values; 0.010, 0.022, 0.029, respectively). There was no significant difference between preoperative and postoperative Cr, CKD-EPI and MDRD values of patients that underwent balloon gastroplasty (p values; 0.421, 0.581, 0.316 respectively) (Summarized in Table 2). This leads us to consider that sleeve gastrectomy has a significant positive effect on renal functions in the short term.

	100.00 (95.00-121.00)	105.00 (96.00-106.00)		99.00 (93.50-105.50)	88.00 (83.00-99.50)	
AST (U/L)	20.73 ± 8.88 19.00 (14.00-25.00)	22.55 ± 16.72 16.00 (14.00-25.00)	0.583*	25.62 ± 9.11 25.00 (19.00-28.50)	26.27 ± 41.16 18.00 (14.00 - 22.00)	0.002**
ALT (U/L)	21.82 ± 13.61 19.00 (13.00-25.00)	26.36 ± 27.20 15.00 (12.00-27.00)	0.667**	32.65 ± 20.22 27.00 (19.00-41.00)	27.38 ± 51.03 14.00 (11.50 - 25.00)	<0.001**
Hb (gr/dl)	13.19 ± 1.81 13.00 (11.30-14.80)	13.5 ± 1.92 13.80 (11.03-14.90)	0.513*	13.29 ± 1.65 13.40 (12.20-14.30)	13.29 ± 1.60 13.50 (12.75-13.95)	0.995*
TSH (uIU/ml)	2.00 ± 0.85 1.65 (1.44-2.54)	1.75 ± 0.70 1.70 (0.95-2.35)	0.674**	2.06 ± 1.36 1.63 (1.19-3.15)	1.78 ± 1.24 1.44 (0.85-2.59)	0.020**

*Paired t Test; **Wilcoxon Signed Rank Test

Discussion

The aim of surgical intervention is to decrease morbidity and mortality associated with obesity, and to recover metabolic and organ functions. Weight loss decreases comorbidity associated with obesity. It also reduces medical treatment costs and number of days spent in hospital, and contributes to the improvement of the quality of life. Bariatric surgery is an option for morbid obese patients that are unable to lose weight.

In obesity surgery, one of the significant operations of restrictive surgery is Laparoscopic Sleeve Gastrectomy (LSG). Clinical results of studies indicate that sleeve gastrectomy is superior. The obvious loss of appetite after sleeve gastrectomy points to the importance of ghrelin hormone, which is closely related to appetite [8]. Sleeve gastrectomy reduces the level of ghrelin and hence appetite, increasing weight loss in obese patients [9,10].

Some epidemiological studies show that obesity is an independent risk factor for chronic kidney disease. Obesity can contribute to impairment in renal functions as it causes hypertension, type 2 diabetes mellitus, coronary artery disease and several other disorders. Obesity is an independent risk factor for the development of chronic kidney disease, and weight loss lowers the risk of end-stage kidney disease [11-13].

The association between obesity and increased renal failure risk has been known. Recovery is observed in kidney functions after weight loss. As GFR measurement formulae like Cockcroft are influenced by weight, we used CKD-EPI and MDRD formulae, which are not dependent on weight. The most important finding is that Cr values decreased and GFR values increased in a short period of time before and after the operation. It is interesting that although weight loss results in recovery of kidney functions, such a recovery was not observed in patients that underwent balloon gastroplasty. The suppression of inflammation after bariatric surgery may have caused the difference in results between two methods of treatment. Studies suggest that losing weight after the surgery is associated with the decrease in renal and systemic inflammation, which causes recovery in renal function and proteinuria level. The recovery in renal inflammation is one of the positive impacts of bariatric surgery on kidney [14,15].

As a result, it is known that the rate of obesity has been increasing across the world. Making changes in life style is the basic approach used in the treatment of obesity [16-18]. However, bariatric surgery is an option for patients that show resistance to medical treatment. Obesity is a risk factor for chronic kidney disease. Abnormal kidney functions are seen more commonly in morbid obese patients. SG enables weight loss, and thus contributes to the improvement of renal functions [19].

References

1. Bilge U, Ünalacak M, Ünlüoğlu I, Ipek M, Çeler Ö, Akalin A. Relationship between 1,25-dihydroxy Vitamin D levels and homeostatic model assessment insulin resistance values in obese subjects. *Niger J Clin Pract* 2015; 18: 377-380.
2. Jensen MD, Ryan DH, Apovian CM. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. *Circulation* 2014; 129: S102.
3. Semins MJ, Asplin JR, Steele K, Assimios DG, Lingeman JE, Donahue S. The effect of restrictive bariatric surgery on urinary stone risk factors. *Urology* 2010; 76: 826-829.
4. Santry HP, Gillen DL, Lauderdale DS. Trends in bariatric surgical procedures. *JAMA* 2005; 294: 1909-1917.
5. Ahmed MH, Ahmed HT, Khalil AA. Renal stone disease and obesity: what is important for urologists and nephrologists? *Ren Fail* 2012; 34: 1348-1354.
6. Barra S, Providência R, Faustino C, Paiva L, Fernandes A, Marques AL. Performance of the Cockcroft-Gault, MDRD and CKD-EPI Formulae in Non-Valvular Atrial Fibrillation: Which one Should be Used for Risk Stratification? *J Atr Fibrillatio* 2003; 6: 36-45.
7. Bilge U, Gültekin G, Bilgin M, Ünlüoğlu İ. Relationship Between Homeostatic Model Assessment Insulin Resistance (HOMA-IR) Values and Glomerular Filtration Rates (GFR): A Retrospective Study. *Ankara Med J* 2015; 15: 220-225.
8. Himpens J, Dapri G, Cadiere GB. A prospective randomized study between laparoscopic gastric banding

- and laparoscopic isolated sleeve gastrectomy: results after 1 and 3 years. *Obes Surg* 2006; 16: 1450-1456.
9. Karamanakos SN, Vagenas K, Kalfarentzos F, Alexandrides TK. Weight loss, appetite suppression, and changes in fasting and postprandial ghrelin and peptide-YY levels after Roux-en-Y gastric bypass and sleeve gastrectomy: a prospective double blind study. *Ann Surg* 2008; 247: 401-407.
 10. Langer FB, Reza Hoda MA, Bohdjalian A, Felberbauer FX, Zacherl J. Sleeve gastrectomy and gastric banding: effects on plasma ghrelin levels. *Obes Surg* 2005; 15: 1024-1029.
 11. Kramer H, Luke A, Bidani A, Cao G, Cooper R, McGee D. Obesity and prevalent and incident CKD: the Hypertension Detection and Follow-Up Program. *Am J Kidney Dis* 2005; 46: 587-594.
 12. Fox CS, Larson MG, Leip EP, Culleton B, Wilson PW, Levy D. Predictors of new-onset kidney disease in a community-based population. *JAMA* 2004; 291: 844-850.
 13. Iseki K, Ikemiya Y, Kinjo K, Inoue T, Iseki C, Takishita S. Body mass index and the risk of development of end-stage renal disease in a screened cohort. *Kidney Int* 2004; 65: 1870-1876.
 14. Fenske WK, Dubb S, Bueter M, Seyfried F, Patel K. Effect of bariatric surgery-induced weight loss on renal and systemic inflammation and blood pressure: a 12-month prospective study. *Surg Obes Relat Dis* 2013; 9: 559-568.
 15. van Dielen FM, Buurman WA, Hadfoune M, Nijhuis J, Greve JW. Macrophage inhibitory factor, plasminogen activator inhibitor-1, other acute phase proteins, and inflammatory mediators normalize as a result of weight loss in morbidly obese subjects treated with gastric restrictive surgery. *J Clin Endocrinol Metab* 2004; 89: 4062-4068.
 16. Çakır M, Piyal B, Aycan S. Healthy Lifestyle Behaviors and Quality of Life in Physicians: A Faculty of Medicine Based Cross-Sectional Study. *Ankara Med J* 2015; 15: 209-219.
 17. Hüseyinsinoğlu BE, Kuş G, Tarakçı E. Obesity Prevention in Adults: Preventive Strategies and Physical Activity. *Euras J Fam Med* 2015; 4: 97-104.
 18. Sönmez B, Aksoy H, Öztürk Ö, Öztürk Z, Kasım İ, Özkara A. The Effects of Diet and Exercise on HbA1c Levels in patients with Type 2 Diabetes under Oral Antidiabetic Treatment. *Konuralp Tıp Dergisi* 2015; 7: 93-98.
 19. Hou CC, Shyu RS, Lee WJ, Ser KH, Lee YC, Chen SC. Improved renal function 12 months after bariatric surgery. *Surg Obes Relat Dis* 2013; 9: 202-206.

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