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CARDIOMETABOLIC RISK REDUCTION AFTER LAPAROSCOPIC SLEEVE GASTRECTOMY

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ABSTRACT

According to statistical data, published in New England Journal of Medicine, Republic of Uzbekistan is leading among the countries of the Central Asia by number of people with excessive weight – they are 44,5 %, and 20,4 % of them are with superobesity. Surgical bariatric treatment of obesity is the unique method which has proved stable efficiency in reduction of excessive weight at patients with morbid obesity for a long time. The purpose of this study was evaluation of cardiometabolic risk regression after laparoscopic sleeve gastrectomy (LSG). There were observed 35 women with morbid obesity. It was established that cardiometabolic risk reduced after LSG because number of women with average risk by CMDS is reduced in 2 times, with low risk is increased in 1,6 times 12 month after surgery. Level of proinflammatory cytokine IL-6 and CRP start declining at earlier period after LSG. Volumetric - linear parameters of heart change synchronously with reduction of excessive weight and is proportional to changes of a surface of a body.

Key words: morbid obesity, cardiometabolic risk, laparoscopic sleeve gastrectomy

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СНИЖЕНИЕ КАРДИОМЕТАБОЛИЧЕСКОГО РИСКА ПОСЛЕ ЛАПАРОСКОПИЧЕСКОЙ РУКАВНОЙ РЕЗЕКЦИИ ЖЕЛУДКА

РЕЗЮМЕ

Республика Узбекистан лидирует среди стран Центральной Азии по количеству людей с избыточным весом – их 44,5%, причем у 20,4% - ожирение. Хирургическое лечение является наиболее эффективным методом лечения морбидного ожирения (МО) в аспекте долгосрочного эффекта снижения избыточной массы тела. Целью исследования было изучение регресса кардиометаболического риска после лапароскопической рукавной резекции желудка (ЛРРЖ). Обследовано 35 женщин с МО. Установлено, что после ЛРРЖ кардиометаболический риск статистически значимо снижается: число женщин со средним риском по CMDS снижается в 2 раза, с низким риском - увеличивается в 1,6 раза. После ЛРРЖ снижается уровень провоспалительных факторов – С-реактивного белка и интерлейкина-6. Объемно-линейные параметры сердца через 12 месяцев после ЛРРЖ изменяются синхронно со снижением избыточной массы тела и пропорционально изменениям поверхности тела.

Ключевые слова: морбидное ожирение, кардиометаболический риск, лапароскопическая рукавная резекция желудка.

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OSHQOZONNING LAPAROSKOPIK QISMA REZEKTSIYASIDAN KEYINGI KARDIOMETABOLIK XAVFNING KAMAYISHI

ANNOTATSIYA

O'rta Osiyo bo'yicha O'zbekiston Respublikasi og'ir vaznli, ya'ni semizlikning ko'rsatkichlari yuqoriligi bilan - 44,5% ni, shuningdek o'ta semizlikning - 20,4% ko'rsatkichlari bilan yetakchi o'rinni egallaydi. Uzoq muddat davomida tananing ortiqcha vaznini yetarlicha

kamaytirishdan ko'ra xirurgik jarrohlik morbid semirishni (MS) davolashda eng samarali usul hisoblanadi. Tadqiqot maqsadi oshqozonni laporoskopik qismi rezektsiyadan (OLQR) keyingi kardiometabolik xavfning pasayishini o'rganish. Morbid semirgan 35 nafar ayol ko'rib chiqilgan. OLQR dan so'ng kardiometabolik xavf statistik jihatdan sezilarli darajada pasaygani aniqlandi: CMDS bo'yicha aniklanganida o'rta xavfga moyil ayollar soni 2 barobarga kamaydi, past xavfga moyilliklari esa 1,6 marotaba oshdi. OLQR so'ng yallig'lanishga moyil faktorlar - S reaktiv oqsili va interleykin - 6 miqdorlari pasaydi. Yurakning hajmli-chiziqli parametrlari OLQR dan 12 oydan keyin ortiqcha vaznning kamayishi bilan birgalikda sinxron ravishda tana yuzasi proportsional o'zgarib borishi kuzatildi.

Kalit so'zlari: morbid semirishi, kardiometabolik xavf, oshqozonning laporoskopik qismi rezektsiyasi.

Introduction. According to statistical data, published in New England Journal of Medicine, Republic of Uzbekistan is leading among the countries of the Central Asia by number of people with excessive weight – they are 44,5 %, and 20,4 % of them are with superobesity [10]. Surgical bariatric treatment of obesity is the unique method which has proved stable efficiency in reduction of excessive weight at patients with morbid obesity for a long time [4,12]. Weight loss is associated with reduction of comorbidity, because reduction of cardiovascular diseases (CVD) observed in 80% of patients [15], number of patients with arterial hypertension (AG) decreased on 52-92%, with dyslipidemia - on 63%; reduction degree of hepatosis observed in 82% of patients after bariatric surgery. Liver fibroses at nonalcoholic fatty liver disease patients decreased in 20% of cases; 83% of patients achieved remission of diabetes mellitus 2 type (DM2), in 95% of patients the quality of life became improved after bariatric surgery [2,4,6]. Taking into account importance of the problem of obesity, in 1997 the International federation of surgery of obesity (IFSO) was formed. Its annually publishes the report about bariatric operations worldwide in the Global Register of IFSO. According to this data, women are 73,7% (50-93 %) of bariatric surgeon patients [7], most of operations - 99,3% performed by laparoscopy technique [11]. In view of close link of obesity with arterial hypertension and disturbances in carbohydrate and lipid metabolism, WHO (2014) offered to expand diagnostic criteria of obesity with accentuation of its metabolically healthy (MHP) and metabolically unhealthy (MUHP) phenotypes. MUHP characterizes with increase visceral adipose tissue depots (abdominal, epicardial, perivascular) and laboratory markers such as hyperglycemia, hypertriglyceridemia, insulin resistance, dyslipidemia, C-reactive protein (CRP) increasing in combination with arterial hypertension [14].

Besides, it is recommended to estimate "global cardiometabolic risk", which represents absolute risk of development of cardiovascular diseases and DM-2 for patients with morbid obesity (MO) [8,13]. For this purpose it is offered to use as classical risk factors of CVD - smoking, high cholesterol, AG, hyperglycemia and the factors directly associated with obesity (insulin resistance, a low level of high density lipoproteins (HDL-C), hypertriglyceridemia (TG) and proinflammatory markers [1,3]. The TG/HDL-C index is an independent predictor for coronary heart disease and can identify cardiometabolic risk [9]. Data of echocardiography (Echo-KG) at patients with obesity can approve cardiac function disturbances.

The purpose of this study was evaluation of cardiometabolic risk regression after laparoscopic sleeve gastrectomy (LSG).

Material and Methods. There were observed 35 women with morbid obesity, treated in State Institution "Republican Specialized Science-Practical Medical Center of Surgery, named after academician V.Vakhidov" in 2015-2020 years. Inclusion criteria were sex (only women), age (only 18-44 years), morbid obesity ($BMI > 40,0 \text{ kg/m}^2$), non smoking. An average age was $33,2 \pm 0,9$ years; $BMI = 44,4 \pm 1,0 \text{ kg/m}^2$. 10 controls were women - volunteer at age $38,4 \pm 1,9$ years old without obesity, $BMI = 23,4 \pm 0,3 \text{ kg/m}^2$, $WC = 76,1 \pm 1,0 \text{ sm}$. Phenotype of obesity determined according S.V. Nedogoda (2016) [3], criteria of MUHP were waist circumference (WC) more 88 sm, fast glucose level more $5,6 \text{ mmol/l}$, TG level more $1,7 \text{ mmol/l}$, dyslipidemia – HDL-C less $1,3 \text{ mmol/l}$, systolic blood pressure more $130/80 \text{ mm Hg}$ [3]. Laboratory tests

included CRP and routine biochemical tests (lipidomic panel, total protein, albumin, glucose, which were made in automatic biochemical analyzer "VITROS-350" (Ortho Clinical Diagnostics, USA). IL-6 were measured in the blood serum using commercially available ELISA kits (VECTOR-BEST, Russia) in immunoassay analyzer ST-360, (China). Cardiometabolic Disease Staging (CMDS) evaluated according Guo F. et al. (2015) recommendations [8]. Laparoscopic sleeve gastrectomy (LSG) was performed on laparoscopic track (Karl Storz, GMBH & CoKG, Germany) with energy platform Force Triad and technology Liger Sure (USA). Duration of observation was 12 months after LSG. For each patient up to 10 controls were matched by pre-surgery BMI, WC, age, laboratory tests. The results are presented as the $M \pm m$. Echo-KG was performed on "Sonos 2500".

Results and Discussion. Laboratory tests data shows that mean level of total cholesterol (TC), TG, HDL-C levels were increased in obese women versus to the control in 1,17 ($p > 0,05$); 2,9 ($p < 0,05$) and 1,67 ($p < 0,05$) times respectively; TG/HDL-C ratio was increased in 3,7 times ($p < 0,05$). Before LSG distribution of MUHP components of obesity at women has shown, that the increase the systolic blood pressure (SBP) had 24 (68,6%) patients, increase of glucose more than $5,6 \text{ mmol/l}$ - had 20 (57,1%), hypertriglyceridemia more than $1,7 \text{ mmol/l}$ - had 6 (17,1%) women, decrease HDL-C less than $1,3 \text{ mmol/l}$ - had 29 (82,8%) patients. Proinflammatory cytokine IL-6 and CRP level were increased exactly versus to the control ($p < 0,05$) in 2,7 and 3,5 times respectively.

The estimation of cardiometabolic risk by CMDS has shown, that before bariatric surgery increase of WC, without pathological changes in markers of carbohydrate and lipid metabolism was at 5 patients (14,3%). A combination of increase of SBP with dyslipidemia (1 stage on CMDS) is revealed at 7 (20 %); a combination of increase of SBP with hyperglycemia and disturbances of one of the lipidomic profile markers (2 stage on CMDS) - at 11 (31,4 %); increase WC, hyperglycemia and pathological changes of two and more parameters of lipidomic profile (3 stage on CMDS) - at 3 (8,6 %), and 4 stage on CMDS was at 9 (25,7 %) patients at whom was DM-2 ($n=8$) and ischemic heart disease (IHD) ($n=1$).

Early postoperative period after LSG (7-th day) characterized by significant decreasing TG (from $2,4 \pm 0,3$ before surgery to $1,8 \pm 0,2 \text{ mmol/l}$ after LSG), TC (from $5,3 \pm 0,2$ to $4,4 \pm 0,2 \text{ mmol/l}$ and TG/HDL-C ratio (from $2,8 \pm 0,1$ to $1,9 \pm 0,2$) ($p < 0,05$) versus pre-surgery level. This changes took place long before weight loss and may be caused by positive changes in adipose tissue (AT) metabolism after LSG due to decreasing of inflammation and TG accumulation in AT. This hypotheses is confirmed by IL-6 and CRP concentrations decreasing exactly on the 7-th day after LSG. IL-6 level decreased from $24,7 \pm 2,2$ to $17,9 \pm 3,0 \text{ pg/ml}$; CRP decreased from $16,1 \pm 0,3$ to $10,2 \pm 0,3 \text{ mg/l}$ at 7-th day after LSG.

12 months after LSG BMI was $33,2 \pm 0,7 \text{ kg/m}^2$, that demonstrates high restrictive effect of this method of bariatric surgery. The estimation of metabolic efficiency of LSG in 12 months after surgery has shown, that number of patients with hyperglycemia decreased in 2,9 times, with AG- in 3,5 times. Mechanism of hypoglycemic efficacy of LSG may include not only restriction of food intake, but incretines secretion change. LSG does not cause malabsorption and digestive tract reconstruction, but it can causes elevation of incretines secretion and may have positive effect on insulin resistance. Incretines

provides insulinocytes activation and early secretion of the insulin as a response to hit of the food in gastrointestinal tract. Some of incretins, such as glucagon-like peptide -1 (GPP-1) can inhibited gluconeogenesis and glycogen degradation in liver, raises the consumption and salvaging the glucose in skeletal musculature. Hypothalamus and pituitary gland have receptor to GPP-1 too, stimulation of these receptors decreased appetite [5].

The estimation of CMDS has shown, that 1 year after LSG the number of patients with III and IV stages authentically

has not decreased, because IHD and DM-2 have only regression but not total recovery. However, there was a clinical improvement of IHD and DM-2 that was showed in transition of disease in easier stage. The amount of patients with II stage on CMDS has decreased in 2,8 times, and with I a stage - has increased, due to change of ratio of patients with low and high cardiometabolic risk. In comparative aspect the diagram of distribution of patients with low and high cardiometabolic risk according CMDS 12 months after LSG is shown on fig. 1,2.

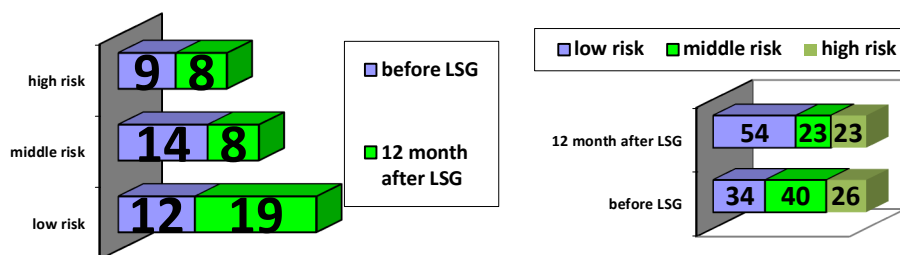


Fig.1. Distribution of women with MO depending on a degree of CMDS (number of patients).

Fig.2. Distribution of women with MO depending on a degree of CMDS (%).

The estimation of factors of an inflammation after LSG has shown, that IL-6 decreased in 1,6 time versus level before surgery ($p < 0,05$), CRP was $4,9 \pm 0,3$ mg/l, that not differ from the control ($p > 0,05$).

Studying of volumetric - straight-line characteristics of heart according to Echo - KG data has shown, that at women with MO end diastolic volume (EDV), end systolic volume (ESV)

1 parameters are necessary for estimating extremely in recalculation on the area of a surface of a body. The threshold of values for an establishment high cardiometabolic risk at women with BMI more 40 kg/m^2 according ROC analysis were more than $55,0 \text{ ml}$ for EDV (AUC= 0,719, Sensitivity- 60,5%) and less than 22 ml for ESV (AUC= 0,724, Sensitivity- 62,5%) (fig.3).

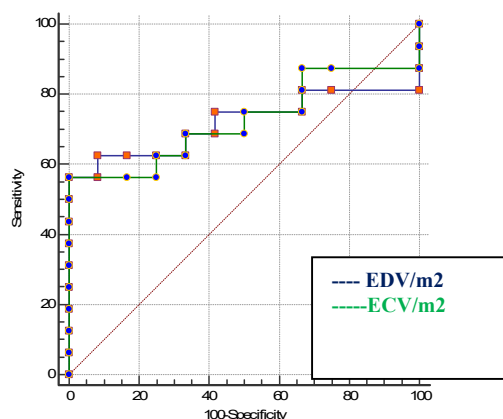


Fig.3. AUC for EDV and ESV in obese women.

Measurement of output fraction of left ventricular (OF) have not different from reference value both before and after LSG. Data of Echo-KG in women with MO before and after LSG shown in the table 1.

Table 1.

Data of Echo-KG in women with MO before and after LSG

Period of estimation	ESV/m2 (ml)	EDV/m2 (ml)	OF, (%)
Before LSG, p1	$24,9 \pm 0,8$	$62,0 \pm 1,6$	$60,3 \pm 0,4$
12 months after LSG, p2	$23,5 \pm 1,1$	$57,4 \pm 1,0$	$58,8 \pm 0,4$
p1:p2	$>0,05$	$>0,05$	$>0,05$

This data suggests that changes of geometry of heart and its constrictive function in dynamics of weight reduction occur synchronously to decrease of excessive weight and is proportional to changes of a surface of a body.

Conclusions.

1. Cardiometabolic risk reduced after LSG because number of women with average risk is reduced in 2

times, with low risk is increased in 1,6 times 12 month after surgery.

2. Level of proinflammatory cytokine IL-6 and CRP start declining at earlier period after LSG.
3. Volumetric - linear parameters of heart change synchronously with reduction of excessive weight and is proportional to changes of a surface of a body.

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