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ORIGINAL ARTICLE

EPICARDIAL FAT IN PATIENTS UNDERGO LAPAROSCOPICAL-SLEEVE GASTRECTOMY

Faris M. Lolan [1], Abdullah S. Mahmood [1]✉, Yasser F. Al-Gburi [2]

[1] College of Medicine, Ninevah University, Alhadbaa Street, 41002, Mosul, Iraq
[2] Ninevah Health Directorate, Baghdad Street, 41002, Ninevah, Iraq

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Summary

Introduction: Obesity is increasingly reported to be a contributing factor to vascular diseases resulting in increased patient morbidity and mortality rates leading to increase healthcare expenses. More precisely, the lipid deposition in cardiac tissues is interesting, due to their direct contribution to the disease initiation, prognosis, and all subsequent patients' fate. We do focus on the determination of the link between changes in body mass index (BMI) and epicardial fat deposition concerning gastric operation.

Objective: The objective of this work was to study the relationship between weight reduction and "epicardial thickness" after laparoscopic-sleeve gastrectomy.

Methods: Critically-ill patients were recruited from private clinics and out-patients hospital clinics. Forty-two patients undergoing laparoscopic-sleeve gastrectomy due to morbid obesity were included in this research. Patients followed for four months after the operation.

Results: The results of this work find there is significant weight reduction in these patients in parallel with a reduction of epicardial fat thickness.

Conclusion: Patients who experience laparoscopic-sleeve gastrectomy showed a reduction in weight in a parallel reduction in epicardial fat thickness.

Key words: laparoscopy; sleeve gastrectomy; morbid obesity; epicardial fat

Introduction

Obesity is a pathological condition in which surplus body fat has accrued to an extent that it may have an undesirable effect on health (1). Overweight is a growing problem all over the world over 4 million people die each year as a consequence of being overweight or obese in 2017 bestowing to the global burden of disease. Morbid overweight is defined as an increase in body mass index (BMI) of more than 40. Bariatric surgery includes a variety of procedures performed on the obese. The U.S. National Institutes of Health recommends bariatric surgery for overweight patients with a BMI of at least 40 and those with a BMI of at least 35 and life-threatening concomitant medical conditions such as diabetes. Epicardial fat is ectopic adipose tissue besieging the heart (2).

✉ Ninevah University, College of Medicine, Alhadbaa Street, 41002, Mosul, Iraq
abdullah.mahmood@uoninevah.edu.iq
☎ +9647740853284

It is a prominent feature in many "cardiovascular diseases" and implicated in the pathogenesis of the "coronary atherosclerotic disease", "atrial fibrillation", and "left heart failure". Therefore, obese persons who had an increase in epicardial fat are more susceptible to cardiovascular diseases (3). It should be noted that obesity can represent a serious health problem linked to excess adipose tissue, especially at the visceral level (abdominal and epicardial fat, i.e. around the heart) as well as subcutaneous. Adipose tissue is not an inert tissue, with the sole function of an energy reserve, but is today considered a real endocrine organ, involved in numerous physiological and pathological processes, including immunity and inflammation (4). In particular, the production of numerous pro-inflammatory and anti-inflammatory molecules, called cytokines, is dysregulated in the "adipose tissue" of subjects suffering from obesity with prevalent production of those with pro-inflammatory activity, which seem to be intricate in the enhancement of insulin defection and in the increased cardiovascular risk associated with obesity itself (5).

The health of the patient suffering from obesity is put at risk mainly due to its comorbidities, such as "type 2 diabetes mellitus", "arterial hypertension and dyslipidemia", which increased the cardiovascular risk, as well as the increase in the incidence of tumors (6). This being the case, it becomes very important to contact the specialist early, not only when a condition of obesity has already been established but also when a simple overweight is in place (7). In this way, it is possible to intervene promptly and prevent the onset of diseases that are potentially risky for health.

Materials and Methods

This study was carried out from July 2018 and July 2019 at Al-Zahrawi private hospital (Mosul City, Iraq). Forty-two patients undergoing "laparoscopic-sleeve gastrectomy" due to morbid obesity were included in this work. Patients followed for four months after the operation.

To substantiate agreement of participation in the study, a "consent form" was collected after being filled and signed by all patients. Patients were reviewed by "two-dimensional transthoracic echocardiography" by "ultrasound machine trademark Sonoscape S12". "Epicardial fat thickness" was assessed by measuring "parasternal long-axis view" in "ventricular diastole" with an assessment of diastolic dysfunction. Baseline BMI, epicardial fat thickness, and diastolic dysfunction taken and assess the changes in BMI, epicardial thickness, and diastolic dysfunction in the first month and after four months of operation. Patients who were excluded are those patients with normal pericardial fat thickness before the procedure patients who had minimal weight reduction or patients who did not adhere to frequent echocardiography checking.

The results of this work are presented as Mean± Standard deviation. Microsoft Excel 2010 was used for "statistical analysis".

Results

The result of this research showed that sleeve-gastrectomy significantly ($p<0.0001$) reduces BMI and epicardial fat thickness significantly after one month of operation. Correspondingly epicardial fat thickness was subsequently reduced compared to baseline values before operation (Table 1).

Table 1. The relationship between operation and BMI and "epicardial fat thickness".

Parameters	Baseline	1-month post-op	p value
BMI (kg/m^2)	42.02±2.99	40.54±2.94	<0.0001
Epicardial fat thickness (mm)	121.71±17.31	118.69±16.97	<0.0001

After four months of operation sleeve gastrectomy, significant ($p<0.05$) reduction in both BMI and Epicardial fat thickness as in Table 2.

Table 2. The relationship between operation and BMI and "epicardial fat thickness".

Parameters	Baseline	4-month post-op	p value
BMI (kg/m^2)	42.02±2.99	37.83±2.69	<0.0001
Epicardial fat thickness (mm)	121.71±17.31	111.26±15.69	<0.0001

Despite the results obtained in Table 1 and Table 2, there was no significant ($p>0.05$) difference between males and females in weight reduction after sleeve gastrectomy as represented in Figure 1 and Table 3.

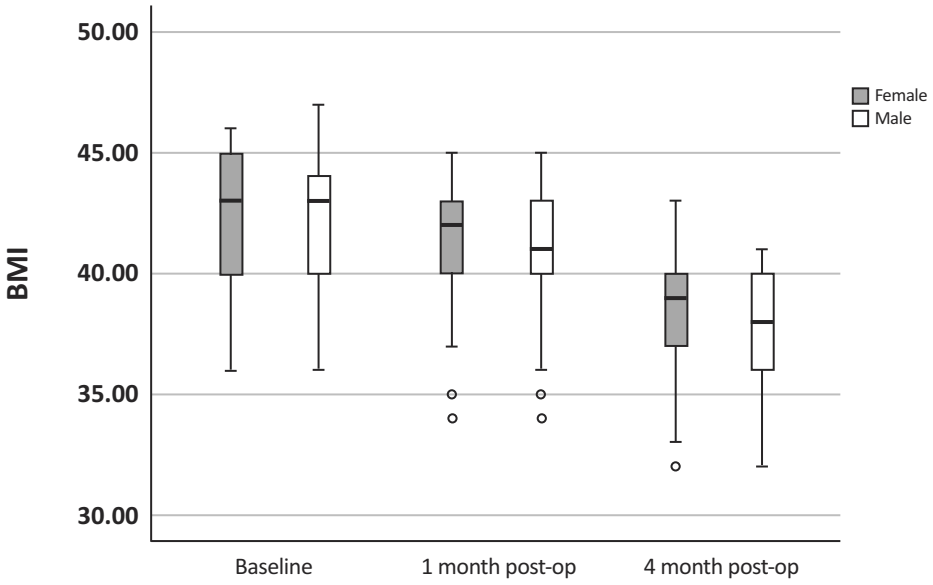

Figure 1. Gender variation with BMI in operated-on patients.

Table 3. BMI changes in an operated-on patient in relation to sex.

BMI, kg/m^2	Male (n=25)	Female(n=17)	p value
Baseline	41.88±2.96	42.23±3.13	0.7
1-month post-op	40.40±2.82	40.76±3.19	0.6
4 months post-op	37.72±2.65	38.00±2.82	0.7

There is no significant difference between males and females in epicardial fat thickness after sleeve gastrectomy as in Figure 2 and Table 4.

Table 4. "Epicardial fat" changes in an operated-on patient in relation to sex.

"Epicardial fat thickness", mm	Male (n=25)	Female (n=17)	p value
Baseline	120.401±8.50	123.64±15.74	0.5
1-month post-op	117.60±17.98	120.29±15.77	0.6
4 months post-op	110.20±16.80	112.82±14.05	0.5

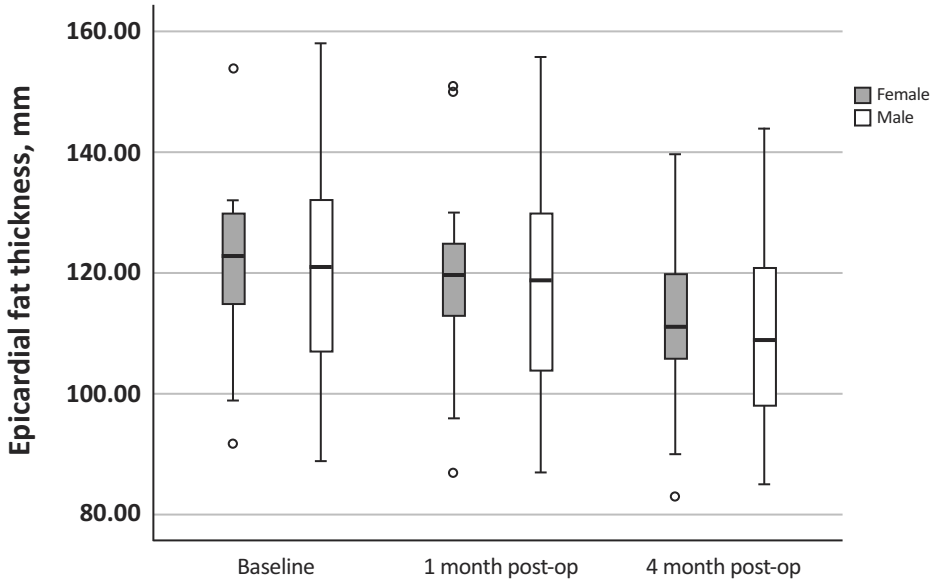

Figure 2. Gender variation with "epicardial fat thickness" in operated-on patients.

Discussion

Once considered a problem in developed and "high-income countries", obesity is now on the rise in "developing countries", particularly in urban areas. In these countries with emerging economies, the rate of increase in childhood obesity was more than 30% higher than in developed countries (1). The BMI, although practical and easy to apply in clinical routine, is certainly a somewhat simplistic index since it does not take into account either body composition ("fat mass, lean mass, and fluids"), or the distribution of visceral fat (2). Therefore, a subject may be overweight but have a large amount of visceral adipose tissue, therefore greater comorbidities, and be equally at risk as a subject who has a higher BMI, however, due to a greater presence of lean mass. For these reasons, obesity represents one of the main public health problems worldwide both due to its increasing prevalence (pandemic) and because it is an important risk factor for various chronic diseases, such as type 2 diabetes mellitus, arterial hypertension, cardiovascular diseases, and cancers. These are associated with sleep apnea syndrome (which increases the risk of sudden death from arrhythmia), osteoarthritis, gallbladder stones, infertility, and depression. Overall, "overweight and obesity" represent the fifth most important risk factor for global mortality ("at least 2.8 million / year of deaths worldwide") and it is estimated that a patient with severe obesity reduces their life expectancy by about 10 years and spends 20 years. in conditions of disability (3-6).

The BMI, although practical and easy to apply in clinical routine, is certainly a somewhat simplistic index since it does not take into account either body composition (fat mass, lean mass, and fluids), or the distribution of visceral fat. Therefore, a subject may be overweight but have a large amount of visceral adipose tissue, therefore greater comorbidities, and be equally at risk as a subject who has a higher BMI, however, due to a greater presence of lean mass.

This work-study the relationship between weight reduction and epicardial fat thickness reduction in-patient undergoing bariatric sleeve gastrectomy (8). There was a significant reduction in BMI after one month and four months of follow up which result in a significant reduction in "epicardial fat thickness" in one and four months of follow-up. Laparoscopic sleeve gastrectomy seems to be an effective treatment to achieve significant weight loss after 12 months of follow-up (9). Epicardial fat, but not "intrathoracic fat", is associated with CVD-independent of traditional measures of obesity but not after further adjustment for the "traditional risk factor" (10). Epicardial fat is associated with atrial conduction as quantified by PWI, even with tweaking for "extra-cardiac fat depots" (11). Therefore, the reduction in epicardial fat thickness theoretically reduces cardiovascular risk.

The mechanism behind sleeve-gastrectomy is mainly caloric tweaking, however, cannot account for the unrelenting "weight loss" and improved "glucose metabolism" seen following SG and AGB. Alternative suggested mechanisms, including changes in "gastrointestinal hormone secretion", a reshuffle of "hypothalamic and vagal control", amendment in energy expenditure, and tweaking of "bile acid metabolism" and the "intestinal flora environment" thought to contribute to the postoperative benefits (12). As pericardial fat is part of body fat when there is a reduction in body fat as a whole the pericardial fat is reduced (13).

To start losing weight you need to change your eating habits by resorting to a healthy and complete diet. It is advisable to divide meals correctly guaranteeing at least 5 per day, ie the three main meals and mid-morning and mid-afternoon snacks; to guarantee a correct protein intake and a certain variety of proteins introduced (meat, fish, eggs, legumes, and cheeses) (14). It is to guarantee the intake of micronutrients (minerals and vitamins) through the daily consumption of fruit and vegetables; to increase fiber intake by consuming pasta or brown rice, to reduce condiments, and to avoid as much as possible simple sugars (sweets in general, sugary drinks and so on), energy-dense foods and "junk food", Preferring instead fresh, seasonal and possibly zero-kilometer foods. A " pyramid " therapeutic approach is used for the treatment of obesity where at the base of the pyramid we find the changes in lifestyle and eating habits that the patient can implement independently or with the help of a professional, if this is not enough a real diet therapy program is associated, "tailor-made" according to the patient's needs. If even this does not bring benefits in terms of weight loss in the short term or terms of weight recovery in the medium-long term, after a few "structured" attempts, followed by a nutrition specialist, we move on to the pharmacological approach. Also important is proper hydration and ensuring good physical activity with the aerobic activity of medium intensity for 30-45 minutes most days (15). In agreement with these observations, prior retrospective research found a decrease in "epicardial fat thickness" after "bariatric surgery", which was related to "the degree of weight loss" (16). A similar conclusion was made by Gaborit *et al*. (17) in a somewhat more latest study. In "a meta-analysis" published by Rabkin and Campbell (18), patients who underwent "bariatric surgery" had a significant decrease in "epicardial fat thickness", which was greater than the result in reducing diet calories alone. Furthermore, additional investigations revealed the same results (19-21).

As a result of these findings, an increasing amount of published work sought to characterize the important role of "visceral fat deposition" in the development of obesity-related pathologies [18]. The measurement of "epicardial fat thickness" is dependent on measuring the deposited fat between the "pericardium and the myocardium" (22). "Epicardial fat thickness" is a relatively new indication for systemic fat accumulation that is easily evaluated by regular "2 D echocardiography" (23). Prior studies have connected systemic diseases (dyslipidemia, ischemic diseases, atherosclerosis, insulin resistance, and cardiac anatomical abnormalities) to an increase in epicardial fat (24, 25). The key reasons underlying the relationship between "epicardial fat" and cardiovascular risk factors are assumed to be the production of inflammatory cytokines and poor adipogenesis (26). As a result, a considerable decrease in "epicardial fat" appears to be a sensible target for any obesity management strategy. Weight loss is an effective method for reducing epicardial fat thickness, according to data obtained (27).

In contrast, a study conducted by Sincer *et al*. 2020, which have confirmed no association between vascular problems and epicardia fat thickness (28). An alternative study conducted by Baysal *et al*. 2019, which have confirmed a negative correlation between vascular problems and cardiac fat thickness (29). Despite that, our results contrast with these findings and this could be explained in the context of the sample of patients used, who were varicocele (28), and asthmatics (29).

Conclusion

To sum up, patients undergoing laparoscopic-sleeve gastrectomy showed a parallel reduction in pericardial fat thickness to weight reduction.

Acknowledgments

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Conflict of Interest

The authors declare that no conflict of interest exists for this research.

Adherence to Ethical Standards

The study was approved by the Medical Research Ethics Committee in Ninevah University. The study approval number and date UOM/COM/MREC/2018 (8) on 23/04/2018.

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