

# Obesity is still a risk factor in coronary artery bypass surgery

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## ABSTRACT

**Objective:** Even with the improvements in surgical techniques and perioperative care, obesity is still a risk factor for occurrence of adverse events following cardiac surgery. In this observational, retrospective study, we aimed to document the effects of obesity on surgical outcomes in patients undergoing coronary artery bypass surgery and find out the effects of improvements in cardiac surgery.

**Methods:** Between January 2011 and March 2013, isolated coronary artery bypass surgery was performed on 790 patients. The body mass index values of the patients were calculated and patients were divided into two groups; below 30 were classified as non-obese group whereas above 30 were classified as obese group. The odds ratio was obtained by using univariate analysis in order to document the effects of obesity on outcomes.

**Results:** There were 548 (69.3%) patients in non-obese group, whereas 242 (30.7%) patients in obese group. The cardiopulmonary bypass (80.47±23.58 vs. 80.89±28.46, p=0.449) and aortic clamp times (54.13±16.60 vs. 54.19±19.85, p=0.511) and number of bypass grafts (3.09±1.02 vs. 2.96±1.00, p=0.11) were comparable between the groups. The mean number of fresh frozen plasma used was higher in obese patients (1.37±1.75 vs. 1.48±4.63, p=0.02). Intubation time was higher in obese patients (10.57±6.87 vs. 12.71±35.31, p=0.014). Total amount of postoperative drainage was higher in non-obese patients (766.77±472.27 vs. 648.72±371.39, p<0.001). The superficial infection/mediastinitis (0.4% vs. 2.5%, p=0.012), dehiscence (0.2% vs. 3.7%, p<0.001) and postoperative renal failure rates (4.7% vs. 8.7%, p=0.031) were higher in obese patients. The incidence of atrial fibrillation was lower in obese patients (19.7% vs. 12.8%, p=0.019). The mortality (0.5% vs. 1.7%, p=0.210) and postoperative stroke rates (1.1% vs. 0.8%, p=1.000) were similar in both groups.

**Conclusion:** We documented that obesity is still a risk factor for occurrence of postoperative adverse events. We believe that improved perioperative care together with meticulous regimens can improve postoperative outcomes in patients undergoing coronary artery bypass surgery. (*Anadolu Kardiyol Derg 2014; 14: 631-7*)

**Key words:** obesity, cardiac surgical procedures, outcome assessment (health care)

## Introduction

The incidences of atherosclerotic heart disease and obesity have increased to alarm levels and became major contributors of public health problems. Among the Turkish population, the incidence of obesity is around 50% in middle aged women (1). Due to the high prevalence, numerous reports concerning the association between obesity and postoperative mortality and morbidity following cardiac surgery have been published. Obesity has been suggested as an important risk factor in cardiac surgery, but in recent years acceptable results have been documented which indicated the influence of the improvements in this field. Yet, there is still controversy (2, 3).

In this study we aimed to document the effects of obesity on postoperative outcomes after coronary artery bypass grafting (CABG) surgery and compare the results in different body mass index (BMI) groups implicating the effects of developments in cardiac surgery and postoperative care.

## Methods

### Study design

The study is an observational retrospective study.

### Study population

Between January 2011 and February 2013, 790 patients subjected to isolated CABG surgery were studied retrospectively in

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Department of Cardiovascular Surgery, Medicana International Ankara Hospital. The medical records of the patients are collected prospectively in the clinic for each patient in a predefined standard form and transferred to the computer. The Hospital Ethics Committee approved the study based on retrospective data, waiving for individual consent of the patients. Following approval, retrospective analysis was performed. The study followed the Declaration of Helsinki 2008 on medical protocol.

The inclusion criterion was isolated CABG procedure. The exclusion criterion was any concomitant cardiac procedure.

### Data collection

The medical records of the patients are collected prospectively in the clinic for each patient in a predefined standard form and transferred to the computer. The data included age, sex, history of diabetes, hypertension, hyperlipidemia, preoperative arrhythmia and atrial fibrillation, peripheral arterial disease, history of cerebrovascular disease, preoperative echocardiography data, history of clopidogrel use, operation type, cardiopulmonary bypass (CPB) and cross clamp times, number of grafts, extubation time, intensive care unit and hospital length of stay times, amount of drainage, number of used blood and blood products, postoperative creatinine and creatinine kinase levels, occurrence of postoperative arrhythmia and stroke.

The patients were divided into two groups as obese and non-obese. The obesity was defined based BMI values defined by World Health Organization (WHO) classification; obese: BMI  $\geq 30$  kg/m<sup>2</sup>, non-obese: BMI  $< 30$  kg/m<sup>2</sup> (4). The BMI distribution of the patients is given in Table 1.

Primary outcome variables included mean time to extubation, ICU and postoperative hospital length of stay, incidence of renal dysfunction, postoperative stroke (current definition of stroke according to WHO is rapidly developing clinical signs of focal or global disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin), postoperative total amount of blood loss, postoperative exploration for hemorrhage, number of used blood and blood products, postoperative atrial fibrillation (AF) rate and in-hospital mortality.

Renal dysfunction was defined on the finding that peak creatinine value was 1.5 or greater times the preoperative value.

The decision for re-exploration for hemorrhage was made when 200 mL/hour of drainage was documented on two consecutive hours despite measures taken or more than 300 mL/hour drainage.

Packed red blood cell (RBC) was given if the hematocrit level fell below 25%. Fresh frozen plasma (FFP) and platelet concentrates (PC) were administered in cases of documented postoperative coagulation abnormalities (international normalized ratio  $> 1.5$ , activated partial thromboplastin time  $> 60$  s and platelet count  $< 80.000/mm^3$ ) or suspected postoperative platelet dysfunction and factor deficiency.

Atrial fibrillation was diagnosed based on electrocardiogram (ECG). All patients were ECG monitored continuously during the

intensive care unit (ICU) and for the first 48 hours in the ward. Soon ECG was immediately performed in cases of irregular pulse, palpitation or symptoms related with possible AF.

### CABG procedure

The most important variables for operation are CPB and cross clamp times, operation type (on-pump or off-pump), number of grafts.

For on-pump cases, the CPB circuit was primed with 1.500 mL Isolyte-S® (Eczacıbaşı-Baxter, Istanbul) which is a balanced electrolyte solution, and 5.000 units of heparin were added. After anticoagulation with heparin (300 U/kg), activated clotting time (ACT) was kept over 480 seconds. CPB was established using a roller pump with a membrane oxygenator (Compactflo Evo, Sorin Group, Mirandola Modena, Italy). The average flow rate varied from 2.3 to 2.4 L/min/m<sup>2</sup>. Surgery was performed under mild hypothermia (33°C). Mean arterial pressure was kept between 45 to 70 mm Hg. All patients were rewarmed to 37°C (nasopharyngeal temperature) before weaning from CPB. Heparin was neutralized with 1:1 protamine sulfate.

Cold (4-8°C) blood cardioplegia, 1000 mL (25 mEq/l potassium) was administered after aortic cross clamping, and 500 ml of repeat doses were given every 15 to 20 minutes (antegrade and from venous bypass grafts, retrograde in patients with left main coronary disease). Terminal warm blood cardioplegia (36-37°C) was given prior to aortic clamp release.

For off-pump cases, 5000 U heparin was administered and ACT was kept above 200 seconds. Deep pericardial suture was employed. Estech® tissue stabilizer system (Estech, Danville, Ca, USA) was routinely used for left anterior descending (LAD) and right coronary artery (RCA) anastomoses. Starfish® (Medtronic, MN, USA) heart positioner was used for circumflex system bypass. Intravenous metoprolol was administered to decrease heart rate and inotropic agents were used to increase blood pressure when necessary.

### Statistical analysis

Statistical analyses were performed using SPSS software for Windows version 17.0 (Statistical Package for the Social Sciences Inc, Chicago, IL, USA). Continuous variables were expressed as 'mean values  $\pm$  standard deviation'. Categorical variables were expressed as numbers and percentages.

**Table 1. The BMI distribution of the patients based on World Health Organization Classification**

	BMI (kg/m <sup>2</sup> )	n	%	
Underweight	<18.50	5	0.6	Non-obese
Normal weight	18.50-24.99	174	22.0	(BMI $< 30$ kg/m <sup>2</sup> )
Pre-obese	25.00-29.99	369	46.7	n=548 (69.3%)
Obese Class 1	30-34.99	178	22.5	Obese
Obese Class 2	35.00-39.99	55	6.9	(BMI $\geq 30$ kg/m <sup>2</sup> )
Obese Class 3	$\geq 40$	9	1.1	n=242 (30.7%)
BMI - body mass index				

**Table 2. Comparison of the two groups by preoperative and intraoperative characteristics**

	BMI <30 kg/m <sup>2</sup> (n=548)		BMI ≥30 kg/m <sup>2</sup> (n=242)		P value <sup>a</sup>
	Mean±SD	Median (Min-max)	Mean±SD	Median (Min-max)	
Age, years	62.42±9.83	62 (33-91)	61.04±9.38	61 (32-86)	0.072
BMI, kg/m <sup>2</sup>	25.93±2.70	26.25 (17.67-29.98)	33.94±5.74	32.60 (30.02-89.73)	<0.001
LVEF, %	54.09±11.50	57 (24-75)	53.92±10.73	56 (27-75)	0.511
LA, cm	3.88±2.58	4 (3-24)	3.56±0.50	4 (3-4)	0.847
WBC/mm <sup>3</sup>	8,448±2,315	8040 (3,710-17,790)	8,247±2,200	8,045 (3,130-15,820)	0.712
Cross-clamp time, min.	54.13±16.60	53 (17-120)	54.19±19.85	51 (6-140)	0.511
CPB time, min.	80.47±23.58	80 (11-171)	80.89±28.46	76 (25-200)	0.449
Number of bypass grafts	3.09±1.02	3 (1-5)	2.96±1.00	3 (1-5)	0.111

<sup>a</sup>Mann-Whitney U Test  
BMI - body mass index; COPD - chronic obstructive pulmonary disease; CPB - cardiopulmonary bypass; LA - left atrium; LVEF - left ventricular ejection fraction

Demographic characteristics and outcomes of the groups were compared using 'Mann-Whitney U test' for continuous variables and 'chi-square test' and 'Fisher's exact test' for categorical variables. Statistical significance was set as 'p<0.05'. The odds ratio values were obtained from univariate analysis.

## Results

Seven hundred and ninety patients were included in the study. There were 548 (69.3%) non-obese patients (BMI <30 kg/m<sup>2</sup>) and 242 (30.7%) obese (BMI ≥30 kg/m<sup>2</sup>) patients. The mean age of the patients was 62.42±9.83 in non-obese group whereas 61.04±9.38 in obese group (p>0.05). The number of female patients in obese group (92; 16.8%) was higher than in non-obese group (83; 34.3%) (p=0.001). The number of patients subjected to emergent surgery was higher in the non-obese group (p<0.05). There were more smokers (current/ex) in the non-obese group (p<0.05). There were more diabetic and hypertensive patients in the obese group (p<0.05 for each). The preoperative demographic characteristics of the patients are given in detail in Tables 2 and 3.

When the intraoperative characteristics of the patients are compared the mean CPB and aortic cross clamp times and mean number of bypass grafts were similar in both groups (Table 2).

When postoperative outcomes are explored (Tables 4 and 5) ICU stay and hospital length of stay were similar in both groups. The mean intubation time was higher in obese patients (10.57±6.87 vs. 12.71±35.31, p=0.014). The amount of chest tube drainage was higher in the non-obese group (766.77±472.27 vs. 648.72±371.39, p<0.001).

The number of RBC pack used and platelet concentrate used were similar whereas mean number of FFP used were higher in obese patients (p=0.020).

The re-exploration for hemorrhage, postoperative stroke and in-hospital mortality rates were comparable between the groups. Postoperative renal failure was observed in 8.7% of patients in the obese group and 4.7% of patients in the non-obese group (p=0.031). Obesity increased the risk of renal failure 1.91 times

(95% CI: 1.01-3.60). One patient in each group required temporary hemodialysis.

Postoperative superficial wound infection/mediastinitis rate was 0.4% in non-obese group and 2.5% in obese group (p=0.012) (OR 6.94; 95% CI: 1.23-70.61). The sternal dehiscence rate was also higher in the obese patients (3.7% vs. 0.2%, p<0.001) (OR: 21.13; 95% CI: 2.89-927.72).

Postoperative atrial fibrillation rate was 19.7% (108 patients) in non-obese patients and 12.8% (31 patients) in obese patients (p=0.019), Obesity was protective against occurrence of AF (OR: 0.6; 95% CI: 0.38-0.94).

## Discussion

This observational retrospective study was made to document whether there is a change in the knowledge that obese patients have higher risks of mortality and morbidity after CABG despite the improvements in surgical techniques, preoperative, perioperative and postoperative care. In our study we found that obesity is not a risk factor for mortality after CABG but is still a risk factor for postoperative renal insufficiency, sternal dehiscence and superficial wound infections. It resulted in longer intubation times and more FFP use. We also documented that obesity has protective effects on postoperative AF occurrence and reduces postoperative amount of drainage.

Cardiovascular surgery showed marked improvements in recent years and 'yesterdays' high risk patients can be operated with acceptable results in today's era. Traditionally, obesity is believed to have direct influence on postoperative mortality and morbidity following open heart surgery. But controversy on the subject is becoming more pronounced and reports documenting neutral effects of obesity on postoperative outcomes due to improvements in surgical techniques, CPB and postoperative care are being published.

Body mass index is a useful method to determine the volume of fat in the body and WHO defined obesity as an excessive fat deposition in the body that may impair health. There are six groups of patients according to their BMI classification (Table 1).

Many reports documented the efficacy of BMI on reflecting body fat and concluded that BMI correlates with the body fat amount and is still the most practical and commonly used test for defining obesity (4).

Demographic data of obese patients generally differ when compared with normal patients. Obese patients have increased risk for hypertension, diabetes mellitus; usually have history of chronic heart failure and pulmonary disorders and they are

**Table 3. Comparison of the two groups by preoperative and intraoperative characteristics**

	BMI <30 kg/m <sup>2</sup> (n=548) n (%)	BMI ≥30 kg/m <sup>2</sup> (n=242) n (%)	P value <sup>a</sup>
Patient total	548 (100)	242 (100)	
Off-pump surgery	24 (4.4)	11 (4.5)	0.917
Emergent surgery	16 (2.9)	2 (0.8)	0.075 <sup>b</sup>
Female gender	92 (16.8)	83(34.3)	<0.001
Current/Ex-smoker	393 (71.7)	145 (59.9)	0.001
Diabetes mellitus	194 (35.4)	111 (45.9)	0.005
Hypertension	338 (61.7)	171 (70.7)	0.015
Dyslipidemia	408 (74.5)	189 (78.1)	0.272
Preoperative β-blocker use	239 (43.6)	120 (49.6)	0.125
Peripheral arterial disease <sup>c</sup>	20 (3.7)	9 (3.7)	0.966
Stroke	9 (1.6)	8 (3.3)	0.137
Carotid disease <sup>d</sup>	27 (4.9)	11 (4.5)	0.813
Chronic renal failure	15 (2.7)	8 (3.3)	0.661
COPD/asthma	42 (7.7)	28 (11.6)	0.075

<sup>a</sup>Chi-square test.

<sup>b</sup>Fisher's exact test

<sup>c</sup>History of therapeutic vascular intervention, history of claudication, angiography/non-invasive proven peripheral arterial disease

<sup>d</sup>History of carotid intervention or angiographic/non-invasive proven >0% stenosis of either carotid

BMI - body mass index; COPD - chronic obstructive pulmonary disease;

CPB - cardiopulmonary bypass; LA - left atrium; LVEF - left ventricular ejection fraction

younger than ordinary patients undergoing CABG (5). We found similar results; the rate of hypertensive and diabetic patients in obese group were higher than non-obese patients. However, in our study the mean ages of obese and non-obese groups were similar.

Various reports indicated the negative effects of obesity on postoperative pulmonary complications. Saleh et al. (2) studied the risk factors of prolonged ventilation in patients undergoing CABG and they found that BMI>35 was a predictor for prolonged ventilation while Christian et al. (3) indicated that obesity was not a risk factor. Alam et al. (5) in their review of 13.115 patients reported increased incidence of pulmonary complications in obese patients. In our study, we documented that intubation times were higher in obese patients. We also studied patients with BMI values below and over 35 as a subgroup analysis and again documented no difference (p=0.434). These findings can be explained by similar clamp and CPB times in obese patients, meticulous preoperative pulmonary care and more accurate postoperative care.

**Table 5. Comparison of the two groups by postoperative variables**

	BMI <30 kg/m <sup>2</sup> (n=548) n (%)	BMI ≥30 kg/m <sup>2</sup> (n=242) n (%)	P value <sup>a</sup>
Postoperative exploration for hemorrhage	29 (5.3)	6 (2.5)	0.077 <sup>b</sup>
Postoperative AF	108 (19.7)	31 (12.8)	0.019 <sup>b</sup>
Renal dysfunction <sup>c</sup>	26 (4.7)	21 (8.7)	0.031 <sup>b</sup>
Postoperative Stroke	6 (1.1)	2 (0.8)	1.000
Superficial wound infection/mediastinitis	2 (0.4)	6 (2.5)	0.012
Sternal dehiscence	1 (0.2)	9 (3.7)	<0.001
Mortality	3 (0.5)	4 (1.7)	0.210

<sup>a</sup>Fisher's exact test

<sup>b</sup>Chi-square test

<sup>c</sup>Defined when peak creatinine value was 1.5 or greater times the preoperative value

AF - atrial fibrillation; BMI - body mass index

**Table 4. Comparison of the two groups by postoperative variables**

	BMI <30 kg/m <sup>2</sup> (n=548)		BMI ≥30 kg/m <sup>2</sup> (n=242)		P <sup>a</sup>
	Mean±SD	Median (Min-max)	Mean±SD	Median (Min-max)	
ICU intubation time, hours	10.57±6.87	10 (2-118)	12.71±35.31	9 (2-480)	0.014
Length of stay					
ICU, hours	47.13±17.63	46 (23-312)	48.03±31.09	46 (20-480)	0.219
Postoperative, days	5.75±1.81	5 (3-22)	6.68±7.59	5 (4-98)	0.483
Drainage tubes removed, hours	39.94±24.72	34 (4-500)	37.62±14.19	34 (24-144)	0.011
Total amount of drainage, mL	766.77±472.27	850 (40-4,000)	648.72±371.39	550 (200-4,000)	<0.001
Number of FFP used	1.37±1.75	1 (0-11)	1.48±4.63	1 (0-59)	0.020
Number of packed RBC used	1.69±1.81	1 (0-12)	1.75±2.68	1 (0-31)	0.765
Number of PC used	0.61±1.91	0 (0-14)	0.49±1.92	0 (0-18)	0.209

<sup>a</sup>Mann-Whitney U Test

BMI - body mass index; FFP - fresh frozen plasma; ICU - intensive care unit; PC - platelet concentrate; RBC - red blood cell

One of the most important complications following cardiac surgery is renal failure. There is controversy on the subject and in recent years it is accepted that obesity does not have adverse effects on postoperative renal complications (6, 7). Conversely, Alam et al. (5) and Prabhakar et al. (8) documented negative effects of obesity on renal functions. The mechanisms postulated are the more common occurrence of diabetes and hypertension in obese patients which increase the likelihood of postoperative renal dysfunction. In this study, we also observed that renal failure was more common in the obese group and obesity increased postoperative renal failure rate 1.91 times. Diabetes and hypertension were also more common in obese patients.

In the issue of effects of obesity on postoperative outcomes, the surgical site infections and mediastinitis must also be considered as important complications. Farsky et al. (9) studied the risk factors for sternal wound infections and they found obesity (BMI>40) as an independent risk factor. Alam et al. (5), Milano et al. (10), and Harrington et al. (11) also stated obesity as a risk factor for mediastinitis and surgical site infections. On the other hand Ledur et al. (12) did not indicate obesity as an independent factor. In our report, we documented that BMI over 30 was a risk factor for occurrence of superficial wound infections and mediastinitis; obesity increased the risk by 6.94 times. In our institution, we take action as soon as superficial wound infection is detected and antibiotic therapy based on antibiograms is initiated together with early debridement. Only one patient had culture detected occult mediastinitis.

In our institution, the sternum closure method is determined according to the protocol previously established based on senior surgeon's experience; routine Robicsek weave is performed in patients with osteoporotic sternum, patients with steroid treatment, diabetic patients with BMI>25.0 and all patients with BMI>30.0. We employ strict perioperative hygiene, improved postoperative care and special protocols designed for obese patients that can even cause bias over non-obese ones, but still infection rate is higher. The sternal dehiscence rate was also higher in obese patients independent of infection rate. The rate of dehiscence increased 21.13 times in obese patients.

When we compared the ICU and hospital length of stay, we observed that ICU stay and hospital length of stay were similar. Alam et al. (5) and Demir et al. (6) also reported comparable ICU and hospital stay times in obese and non-obese patients. On the other hand Choi et al. (13) documented that obese patients had longer operation times, ICU and hospital stay.

In the review by Alam et al. (5) comprising 13.115 patients (5), mortality rates were not significantly different between obese and non-obese patients. Wigfield et al. (14) also documented similar results, but they reported an increase in rates of complications like prolonged ventilation and acute renal failure without hemodialysis. Conversely, Wu et al. (15) reported that obesity was an independent risk factor for mortality in long term follow-up after coronary bypass surgery. We documented that the mortality rates were similar in both groups.

Postoperative drainage amounts were higher in normal patients compared to obese ones in various reports (5, 16-18). This association can be explained by increased levels of endothelial dysfunction markers like fibrinogen and von Willebrand factor in obese patients associated with hypercoagulability (19). Birkmeyer et al. (20) studied the effects of obesity on postoperative bleeding in 11.000 patients. They revealed that obesity was protective for postoperative hemorrhage due to lower hemodilution compared to normal weight patients and also the mentioned procoagulant state. In our study, similarly, the amount of drainage was lower in obese patients.

The rate of postoperative AF occurs up to 30% following CABG surgery. Besides the well-documented factors, obesity is also blamed for occurrence of AF (21). However, patients with increased body weight are more prone to insulin resistance and have increased preoperative HbA1c levels. As a consequence they require increased doses of insulin perioperatively which decrease the incidence of postoperative AF (22). In our study, we observed that the AF rate was lower in obese patients. We did not study the preoperative HbA1c levels or amount of insulin administered, but we believe that those obese patients required increased doses of insulin perioperatively which decreased AF rates.

In recent years, approach for obese patients has shifted to a surprising area. It is well-known that obesity is a risk factor for diabetes, high blood pressure, sleep apnea and other medical conditions that may contribute to heart problems. Recent studies have now shown that obese patients fair better after open heart surgery (23-25). This is called the obesity paradox and it continues to surprise physicians and scientists. The obesity paradox is also consistent among coronary artery bypass graft surgery patients. That is, an obese patient undergoing CABG is significantly more likely to be alive several years later than is a normal-weight person. There are several explanations for this controversy. The obese patients undergoing CABG surgery are relatively younger; they are fresher. These patients are also on more aggressive medical therapy and invasive management. Also they have more intense preoperative, intraoperative and postoperative care. As a result, they are better treated than the normal BMI patients (23, 24).

Atalan et al. (25) reported a similar retrospective observational study in 2012 and stated the results of 803 patients. They found a remarkable mortality rate in underweight group as 20%. They also indicated that underweight patients have prolonged intensive care unit and hospital stay, increased risk for gastrointestinal bleeding, ventilator-associated pneumonia, blood transfusion and increased mortality rates whereas obese patients have similar results with normal weight patients. They pointed out that being underweight, history of hypertension and chronic renal insufficiency are independent risk factors for mortality after CABG operation. This recent study indicates that the knowledge concerning the effects of obesity on postoperative outcomes is evolving. Another remarkable result is that, being underweight increases the early postoperative complications. They explained these results with obesity paradox and frailty syndrome. Obese patients

have higher plasma renin and atrial natriuretic peptide activity, lower systemic vascular resistance and sympathetic nervous system activity. The frailty syndrome is associated with low activity levels, low energy, low muscle strength and weight loss. These patients have increased levels of inflammation markers that may lead to myocardial dysfunction. Yet, there are still controversies on this subject because some other reports indicated higher levels of inflammation markers in obese patients (26).

## Study limitations

The study includes only in-hospital data. It lacks early and mid-term follow-up data which would document more reliable results.

## Conclusion

In today's era, obesity is still a risk factor for occurrence of adverse events in cardiac surgery. Mortality and postoperative stroke rates were similar in obese and non-obese patients whereas postoperative renal failure, infection and dehiscence rates were higher in obese patients. Meticulous regimens in perioperative care of obese patients including early mobilization, strict blood glucose level monitorization and intense pulmonary care are required to improve outcomes.

**Conflict of interest:** None declared.

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### ESC and Dr. Hünük

Young academician, and cardiologist Dr Burak Hünük who is a member of the Turkish Association of Cardiology, and one of the authors of The Anatolian Journal of Cardiology has been awarded ESC Training Fellowship Grant. Many reports of Dr. Hünük have been presented in many congresses organized by ESC, and EHRA. With this financial aid advanced training is planned for Dr. Hünük in UZ Brussel/Heart Rhythm Management Centre in Brussels, Belgium under the directorship of Prof. Dr. Pedro Brugada. In the opening ceremony of ESC, Dr. Hünük was announced as the only cardiologist from Turkey who was awarded this grant. We congratulate Dr. Hünük very sincerely for his achievement, and we will be honoured to analyze his original research articles published in The Anatolian Journal of Cardiology.