KLİNİK ÇALIŞMA / CLINICAL RESEARCH

MORBID OBESITY IN CARDIAC ANESTHESIA: RETROSPECTIVE EVALUATION OF THIRTY MORBID OBESE PATIENTS

KARDİYAK ANESTEZİDE MORBİD OBEZİTE: 30 MORBİD OBEZ HASTANIN RETROSPEKTİF ANALİZİ

Aslı DEMİR, Çiğdem YILDIRIM GÜÇLÜ, Bahar AYDINLI, Büşra TEZCAN, Ahmet SARAÇ, Aslı DÖNMEZ, Özcan ERDEMLİ

Yüksek İhtisas Training And Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Turkey

Yüksek İhtisas Eğitim ve Araştırma Hastanesi, Anesteziyoloji ve Reanimasyon Kliniği, Ankara

SUMMARY

Background: *The increasing prevalance of obesity is a public health issue and is thought as a potential risk factor in open heart surgery. We aimed at presenting perioperative care, anesthetic management, short term mortality, and morbidity data of 30 morbid obese patients who underwent cardiac surgery.*

Methods: *Thirty patients who had body mass index (BMI) of 40 kg m² or greater, and who underwent cardiac surgery were examined. Anesthetic and surgical data, intensive care unit forms, and epicrisis were analyzed through patient files. Demographic data, ASA classifications, co-morbid diseases, smoking, ejection fractions and Euroscore values were recorded. Surgical technique, type of operation, cross- clamp time, cardiopulmonary bypass time and length of operation were examined. Postoperative intensive care unit (ICU) data, length of hospitalization and ICU, complications and types of discharge were recorded from patients' files.*

Results: *Of the 30 patients, the mean age was 56.0±9.06 and body mass index was 42.29±1.9, and 73.3% of the patients were women. Twenty two patients had coronary artery bypass grafting and 8 had valve and other surgical procedures. 6 of 30 patients had several postoperative complications. One patient had weakness on the left side postoperatively. Two patients had diarrhea, nausea and vomiting, and gastric distention in the ICU. One patient was operated for sternal dehiscence. Another one had pneumonia and one had cellulite on safen vein region.*

Conclusion: *As a result of our study, morbid obesity is not associated with an increased mortality after cardiac surgery, which is in line with other data available.*

KEY WORDS: *Obesity; Cardiac Anesthesia*

ÖZET

Amaç: *Genel bir sağlık sorunu olan obezite prevalansı giderek artmaktadır ve açık kalp cerrahisi için potansiyel bir risk faktörü olarak düşünülmektedir. Biz bu sunuda kardiyak cerrahi geçiren 30 morbid obez hastanın perioperatif bakımı, anestezi yönetimi, kısa dönem morbidite ve mortalite bilgilerini sunmayı amaçladık.*

Yöntem: *Kardiyak cerrahi geçiren vücut kitle indeksi 40 kg m² ve üzerinde olan 30 hasta incelendi. Hasta dosyalarından anestezi ve cerrahiye ait veriler, yoğun bakım takip formları, epikrizler değerlendirildi. Demografik veriler, ASA sınıflaması, yandaş hastalıklar, sigara kullanımı, ejeksiyon fraksiyonu ve euroskor değerleri kaydedildi. Cerrahi teknik, operasyon tipi, kros-klemp, kardiyopulmoner baypas ve operasyon süreleri incelendi. Hasta dosyalarından ameliyat sonrası yoğun bakım verileri, yoğun bakım ve hastanede kalış süreleri, komplikasyonlar ve taburculuk şekilleri bulundu.*

Sonuçlar: *30 hastanın ortalama yaşı 56,0±9,06, ortalama VKİ 42,29±1,90 bulundu. Olguların %73,3'ü kadındı. 22 hastaya koroner arter baypas greft operasyonu, 8'ine kapak ve diğer prosedürler uygulandı. 30 hastadan 6'sında ciddi postoperatif komplikasyon görüldü. Bir hastada postoperatif dönemde sol tarafta güçsüzlük bulundu. 2 hastanın yoğun bakımda diyare, bulantı-kusma ve gastrik distansiyonu oldu. 1 hasta sternal ayrılma nedeniyle opere edildi. Bir hastada pnömoni, diğer bir hastadada safen bölgesinde selülit geliştiği görüldü.*

Tartışma: *Morbid obezite diğer yayınlarda olduğu gibi çalışmamızda kardiyak cerrahi sonrası artmış mortaliteyle ilişkili bulunmadı.*

ANAHTAR KELİMELER: *Obezite; Kardiyak Anestezi*

INTRODUCTION

Obesity is an increasing clinical situation, which predisposes many chronical diseases. The American Heart Association and The World Health Organisation define obesity as a body mass index (BMI) of 30 kg m^2 or greater, and morbid obesity as a BMI of 40 kg m^2 or greater (1). Obese patients are likely to have other comorbidities, including type II diabetes mellitus, hypertension, hyperlipidemia, stroke and coronary artery disease (2).

Obesity has been considered as a major risk factor of morbidity and mortality in patients undergoing cardiac surgery. Though, morbidity associated with obesity is increased, mortality did not differ between obese and non obese patients (3). On the other hand, the preoperative scoring systems, used in cardiac surgery, are also confusing. While Euroscore does not include body mass index in risk scoring, Parsonnet classification gives 3 points for BMI>35 kg m^2.

Several difficulties could be observed in anesthetic management of obese patients at both postoperative and intraoperative period, and during procedures like transporting, positioning, entubation, extubation, arterial and venous cannulation. The medications differ according to the distribution of volume and metabolism. Besides, the differences in cardiac and respiratory systems, impaired glucose tolerance, increased gastric acid secretion and volume status are the important points that must be considered.

We aimed to present perioperative care, anesthetic management, short term mortality and morbidity data of 30 morbid obese patients undergoing cardiac surgery.

METHOD

This retrospective study was designed for patients aged 40-69, ASA II-III and BMI>40 kg m^2 underwent cardiac surgery between January 2007 and December 2009 at our institution. Anesthetic and surgical data, intensive care unit (ICU) forms, discharge reports were analyzed from patient files. Demographic data, ASA classifications, co-morbid diseases, smoking status, left ventricular ejection fractions and Euroscores were recorded. Surgical techniques (beating heart or pump use), type of operation, cross-clamp times, cardiopulmonary bypass (CPB) and operation times were examined.

We determined that all patients had oral diazepam (Deva) 5-10 mg one night before and morphine (Galen) 0.1 mg kg^{-1} 30 minutes before surgery as premedication. ECG, invasive arterial blood pressure, peripheral oxygen saturation, end-tidal CO_2, central venous pressure (obtained from internal jugular vein), nasopharyngeal and rectal temperature monitoring had been used. As anesthesia induction, midazolam (Roche Ltd Basel, Switzerland) 0.1 mg kg^{-1}, fentanyl (Janssen-Cılag, Beerse-Belgium) 5-10 mcg kg^{-1}, rocuronium 0.5 mg kg^{-1} (Schering), and for maintenance 50% O_2/medical air with fentanyl, midazolam and rocuronium had been used. For CPB; membrane type oxygenator and pipes (Dideco, İtaly) had been applied, and as prime solution 1500 mL Ringer Lactate with 30 mEq HCO_3, 1 gr vitamin C (İ.E.Ulagay), 1 gr cephazoline (Mustafa Nevzat), mannitol (2.5 ml kg^{-1}) (Polifarma) and heparin

Table 1. Demographic data and comorbid disease

	n	%
Age, mean±SD	56.0±9.06	-
Gender(Female/male)	22/8	73.3/26.6
ASA (II/III)	25/5	83.3/16.6
Smoking (At least one a day, regulary cigarette smokers)	3	10
Diabetes Mellitus (diagnosed fasting blood glucose>200 mg/dl)	13	43.3
Hypertension (diagnosed >140/90 mmHg)	30	100
Chronic obstructive lung disease (diagnosis confirmed by spirometry)	10	33.3
Peptic ulcus (diagnosis confirmed by endoscopy)	4	13.3
Hyperlipidemia (total cholesterol>200 mg/dl)	18	60
Metabolic syndrome		
(insulin resistance, hyperglycaemia, abdominal obesity, arterial hypertension, atherogenic dyslipidemia, a prothrombotic state, and a proinflammatory state)	13	43.3
Sleep apnea syndrome (diagnosed)	1	3.3
Transient ischemic event (sudden, focal neurologic deficit that lasts for less than 24 hours)	1	3.3
Deep venous thrombosis	1	3.3
Ejection fraction,mean±SD	55.7 ± 6.63	-
Critical preoperative situation (ventricular fibrillation, ventricular tachycardia, massage, intraaortic balon pump,acute renal failure)	0	0

(50 IU kg^{-1}) (Mustafa Nevzat) had been used. Alfa stat management was preferred for blood gas analysis, and normokapnia was maintained as $PaCO_2$: 30-40mmHg. During CPB mean arterial pressure was 50-70 mmHg. Antegrade/retrograde cardioplegia solution (Plegisol) and blood cardioplegia had been applied for every 20 minutes for cardiac arrest. All patients had aortic cross-clamping for the operation.

Postoperative ICU data, medications, length of hospitalization and ICU, complications and type of discharge were recorded from patients' files.

RESULTS

Twenty two female and 8 male morbid obese patients were evaluated in this study. All 30 patients were hypertensive preoperatively. The mean age was 56±9.1 and BMI was 42.3±1.9 kg m^2. Thirteen patient had metabolic syndrome (43.3%). Demographics and co-morbid diseaes were shown in Table 1. CPB was used for all 30 patients and 28 patients were operated under elective conditions (Table 2). Twenty two patients had coronary artery bypass grafting and 8 had valvular and other type of procedures (Table 3).

One patient had mallampati score 4, all difficult airway preparations had been made, but, entubation was done easily. Another patient, who had mallampati score of 2, was hardly entubated and graded as III according to Cormack-Lahane classification.

According to literatures any adverse events following surgery and absent preoperatively (during intensive care unit stay) were recorded as "post-operative complication", and those which had still been present at discharge were recorded as "discharge with morbidity" in this report (2,3,4). Six out of 30 patients had several postoperative complications (Table 4). A patient, who had a history of transient ischemic attack, had weakness on left side postoperatively. The computerized tomography (CT) scan and neurological examination was normal and he was discharged with a little weakness on hand, hence, this patient was recorded as "discharge with morbidity". Two patients had diarrhea, nausea and vomiting, gastric distention in the ICU. A patient who developed mediastinitis was operated for sternal dehiscence. Another one had MRSA pneumonia (who had prolonged ventilation) and one had cellulitis on saphenous vein region. These 3 patients were the ones who had ICU stay more than 2 days and 2 of them were diabetic. While 4 patients had long ICU stay (>2 days), 14 patients stayed more than 10 days in hospital. Though, six patients had post-operative complications, 14 had prolonged hospitalization. These 8 remaining patients out of 14 had diabetes mellitus, and had longer hospitalization in order to regulate blood sugar. These patients have been possessing diabetes mellitus preoperative and postoperative periods (this is not new develpoed event). Because of then we didn't accept this issue as a ''discharge with morbidity''. Fortunately, none of our patients was lost. (Table 5) The mean standart Euroscore was 3.96±1.56 and logistic Euroscore was 3.62±1.94.

DISCUSSION

We aimed to present perioperative data of the patients who underwent cardiac surgery with a BMI of 40 kg m^2 and greater in this case series. Twenty two of the patients were female, and majority of all patients were ASA II. As expected; all patients suffered from hypertension,

Table 2. Operation data

	n	%
Operation type (elective/emergent)	28/2	93.3/6.6
Surgical method (pump/beating heart)	30/0	100/0
Cross-clamp time (min), mean±SD	57.83±26.98	-
CPB time (min), mean ±SD	93.66±40.71	-
Operation time (min), mean ±SD	258.16±79.18	-

SD: Standart deviation

Table 3. Surgery performed (n)

	n	%
CABG (coronary artery bypass greft surgery)	22	73.3
AVR (aortic valve replacement)	2	6.6
MVR (mitral valve replacement)	2	6.6
MVR (mitral valve replacement) + AORTIC EXPLORATION	1	3.3
AVR (aortic valve replacement) + MITRAL EXPLORATION	1	3.3
CABG (coronary artery bypass greft surgery) + ASSENDAN AORT ANEURYSM	1	3.3
ASD (atrial septal defect repair)	1	3.3

Table 4. Postoperative complications

	n	%
Neurologic (temporary or permanent)	1	3.3
Prolonged ventilation (>24 hours)	1	3.3
Renal failure (required dialysis)	0	0
Revision for bleeding	0	0
IABP(intraaortic balon pump)	0	0
Perioperative MI	0	0
Arrhytmia (requiring intervention)	0	0
Arrest- reentubation	0	0
Pulmonary emboli (diagnosed)	0	0
DIC	0	0
Pneumonia	1	3.3
GIS complication (gastrointestinal bleeding, vomiting, ileus, subileus, mesenteric ischemia, cholecystitis, extremely elevated liver enzymes, pancreatitis, hepatitis)	2	6.6
Infection (in anywhere)	2	6.6

Table 5. ICU stay, hospitalization (LOS),mortality-morbidity, euroscore values

	n	%	mean ± std dev
ICU stay (0-2 / 3-11 / >11 day)	26/3/1	86.6/10/3.3	1.16 ± 0.46
LOS (0-10 / 11-30 / >31day)	16/12/2	53.3/40/6.6	1.53 ± 0.62
Discharge with recovery	29	96.7	-
Discharge with morbidity	1	3.3	-
Mortality	0	0	-
Euroscore standart	-	-	3.96 ± 1.56
Euroscore logistic %	-	-	3.62 ± 1.94

which is one of the obesity related risk factors. Hypertension is a common health problem and is one of the five obesity related diseases. Thirteen of our patients had diabetes mellitus, 18 had hyperlipidemia and 23 had coronary artery disease. None of the patients had a medical history of permanent stroke but one patient had history of TIA. Morbid obesity, hypertension, insulin resistance and hyperlipidemia are the risk factors for the development of cardiovascular diseases and share common etiopathogenesis. Co-existence of these diseases is defined as "metabolic syndrome".

In this case series; the incidence of metabolic syndrome was 43.3%. Patients with metabolic syndrome were associated with a higher risk of postoperative complications compared with non-diabetic obese ones (1,4). The concomitance of obesity and diabetes mellitus is well known to be a risk factor for perioperative morbidity and mortality in cardiac surgery. Yap (5) found that 50.9% of the morbid obese patients had diabetes mellitus in his study. The percentage of female gender was 48.1%, CABG surgery 71.5% and valve replacement surgery 28.5% in the same study. When all the patients were evaluated; the incidence of diabetes mellitus was 43.3%, female gender 73.3%, CABG surgery 73.3% and valve replacement surgery 20% in our study. Pan (4) reported that 48% of the diabetic morbid obese patients and 27% of the non-diabetic morbid obese patients were female. Another study examined cardiac surgery patients who had a BMI of 50 kg m^2 or greater presented the percentage of female sex as 37%, diabetes mellitus as 51%, and CABG surgery as 53% (6). In our study; 76.9 % of diabetic patients and 70.5% of non-diabetic patients were female. The surgery indications and incidence of diabetes mellitus were similar, though, females were overrepresented in our case series. In our country; obesity and metabolic syndrome are more frequent in female population, hence, these results are somewhat expected (7).

The concomitance of morbid obesity and hyperlipidemia was 60% in our case series. Previous studies demonstrated this ratio between 39% and 81.1% (2,3,5,6).

Chronic Obstructive Pulmonary Disease (COPD) is typically related with increased BMI and decreased FEV1, FVC, TLC and ERV. Thoracic restriction, associated with obesity is usually mild and is attributed to the mechanical effects of fat on the diaphragm and the chest wall: diaphragm excursion is impeded and

thoracic compliance is reduced. Clinically significant restrictive pattern can be defined as TLC under 85% of the expected. This pattern is almost only seen in obese population. The COPD ratios in morbid obese patients undergoing cardiac surgery in literature are given as 14%, 20.6%, 24%, 32.5% (1,4,8,9). In our case series 33.3% of the patients had COPD at preoperative period. Only one patient had prolonged ventilation (longer than 24 hours) among these patients. Of note, this patient had also MRSA pneumonia. Since, pneumonia, prolonged ventilation and pulmonary embolism were considered individually, these were not considered as respiratory complication.

Obesity is also a well recognized risk factor for obstructive sleep apnea (OSA). Increased fat tissue deposition in the pharyngeal region and reduced lung volumes decrease upper airway size and change the airway configuration in obesity. The collapsibility of the airway increases and repetitive airway closures are observed during sleep. Seventy percent of the people with OSA are obese and 40% of the obese people have OSA. Villavicencio (6) remarked the prevalance of OSA as 28% in the patients undergoing cardiac surgery and who had a BMI of 50 and greater. OSA prevalance is variable in the general population; 25-85% among men and 10-37% among women. This is due to the ethnicity and geography. One of our patients had a diagnosis of OSA (3.3%), stayed 2 days in ICU and discharged from hospital with cure.

When the details about operations were evaluated, it was observed that all procedures had been performed with cardiopulmonary bypass and urgent operation ratio was 6.6%. In accordance with the literature, cross clamp time was 58 minutes, cardiopulmonary bypass time was 94 minutes. Kuduvalli (3) reported the times as 63-106 minutes, while Villavicencio (6) 63-98 minutes and Wighfield (2) 98-139 minutes respectively.

Comorbidities of obese cardiac surgery patients and surgical conditions influence emergence of complications. This is why the literature about morbidity and mortality of these patients are confusing (8). All patients were discharged alive and only 6 patients had postoperative complications in our study. One patient had prolonged ventilation (3.3%). Engel (1) found this ratio 8%, Yap (5) 15.4%, and Villavicencio (6) 20%. There are many literatues about prolonged ventilation in obese and weak patients (10-12). The patient who had prolonged mechanical ventilation support in our series, had had history of hypertension, hyperlipidemia and COPD. His ejection fraction was 40% and he had CABG operation. Despite 18 minutes of cross-clamping, 38 minutes of CPB and unproblematic surgery, abdominal distention occured postoperatively and insufficient breathing resulted in delayed extubation. During his follow up, MRSA was isolated in deep tracheal aspiration. Because of pneumonia, ICU stay was more than 11 days; length of stay was more than 31 days. He had no more gastrointestinal problem and was discharged from hospital with cure.

Yap (5) defined stroke as coma or neurological deficit that occured after 24 hour of operation while evaluating postoperative complications. According to this definition, one patient had weakness on left hand (3.3%), evaluated by Neurology Clinic and discharged with morbidity. This patient had metabolic syndrome and TIA history but no neurological deficit was found at preoperative evaluation. Stroke incidence was 0.7%, 0.9%, 2% in the literature (4,5,6,13).

One patient in our series had nausea, vomiting and bloody diarrhea. The problem was thought to be related to wide spectrum antibiotics. He was healed after treatment and discharged with cure.

Two infected cases in Table 4 were: One who was diabetic (3.3%) suffered from mediastinitis, and treated with debridement which resulted in recovery. Sternal wound infection ratio was 0.7% and mediastinal reexploration was 1.3% in a study (4). Sun (9) represented that sternal infection was 0.7%, another study remarked that mediastinitis ratio was 2%, and reoperation related wound infection was 5% (6). Another non-diabetic patient had cellulitis (3.3%) on the leg on which saphenous vein resected, but discharged with prolonged stay of hospital. Pan (4) determined that saphenous infection in morbid, obese and non- diabetic patients was 2.6%, and 8.1% in diabetics.

In conclusion, morbid obesity according to our study and other data available is not associated with an increased mortality after cardiac surgery. At preoperative period, the patients must be evaluated carefully in terms of events like prolonged ventilation, thromboembolic events, and infection which can potentially lead to morbidity, and all precautions must be taken. Optimizing the management of co-existing diseases would reduce the possibility of postoperative complications. Success in anesthetic management includes paying attention asepsis at all periods, to understand the pathophysiology of obesity and eventually to follow up cautiously.

Yazışma Adresi (Correspondence):
Dr. Aslı DEMİR
1431. cadde Alkar sitesi 24/13,
Çukurambar, Ankara
E-posta (e-mail): zaslidem@yahoo.com

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