Open Heart Surgery in a Newly Established Cardiovascular Department: A Retrospective Evaluation of the First 450 Cases

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ABSTRACT

Introduction: The Department of Cardiovascular Surgery at the Sisli Hamidiye Etfal Training and Research Hospital was founded in 2014, and the first open heart surgery was performed on November 19, 2014. We aim to evaluate the results of the first 450 open heart surgeries retrospectively.

Patients and Methods: Records of the first 450 consecutive open heart surgeries performed between November 2014 and October 2019 were retrospectively evaluated. All patients were treated with acetylsalicylic acid (100 mg/day) up to the preoperative day, and those who had acute coronary syndrome were continued to be treated with clopidogrel (75 mg/day). In all cases, the surgeries were performed through median sternotomy. The standard cardiopulmonary bypass technique was used in all patients who underwent coronary artery bypass grafting (CABG). Antegrade blood cardioplegia was given at 20-minute intervals to achieve a diastolic arrest of cardiac activity. In patients who underwent CABG, proximal anastomoses were performed under a side clamp, and sometimes, with single clamp technique depending on the patient characteristics.

Results: The mean age of the patients was 58.7 years. The most common comorbidity seen in the patients was hypertension (62.9%). Other comorbid diseases observed in the patients were diabetes mellitus (43.6%), hyperlipidemia (28.0%), chronic obstructive pulmonary disease (24.9%), peripheral arterial disease (13.1%), and chronic renal dysfunction (4.7%). In-hospital death occurred in 33 of 450 patients with a mortality rate of 7.3%.

Conclusion: Open heart surgeries can be performed with reasonable and successful mortality rates in our center.

Key Words: Coronary bypass grafting; open heart surgery; new center

Yeni Kurulan Kalp ve Damar Cerrahisi Kliniğinde Açık Kalp Cerrahisi: İlk 450 Olgunun Retrospektif Değerlendirmesi

ÖZET

Giriş: Kasım 2014 tarihinde faaliyete geçen Şişli Hamidiye Etfal Eğitim ve Araştırma Hastanesi Kalp ve Damar Cerrahisi Kliniğinde, 19 Kasım 2014 tarihinde ilk başarılı açık kalp ameliyatı yapılmıştır. Bu çalışmanın amacı, yapılan ilk 450 açık kalp ameliyatının sonuçlarını değerlendirmektir.

Hastalar ve Yöntem: Kasım 2014-Aralık 2019 tarihleri arasında açık kalp ameliyatı yapılan toplam 450 hasta retrospektif olarak değerlendirildi. Stabil koroner arter hastalığı olan tüm hastalar operasyon gününe kadar 100 mg/gün asetilsalisilik asit ile tedavi edilirken, akut koroner sendromu olan olgularda 75 mg/gün klopidogrel tedavisi kesilmedi. Tüm olgularda operasyon medyan sternotomi ile yapıldı. Koroner arter baypas greftleme uygulanan tüm hastalarda standart kardiyopulmoner baypas tekniği kullanıldı. Diyastolik kardiyak arrest sağlamak için 20 dakikalık aralıklarla antegrad kan kardiyoplejisi verildi. CABG operasyonunda proksimal anastomoz yan klemp altında ve bazen hasta özelliklerine bağlı olarak tek klemp tekniği ile uygulandı.

Bulgular: Hastaların yaş ortalaması 58.7 (19-87 yıl) yıl idi. Hipertansiyon (%62.9) en sık eşlik eden hastalık olup bunu diabetes mellitus (%43.6), hiperlipidemi (%28.0), kronik obstrüktif akciğer hastalığı (%24.9), periferik arter hastalığı (%13.1) ve kronik böbrek disfoksiyonu (%4.7) takip etmiştir. Hastane mortalitesi 450 hastada 33 (%7.3) olarak gerçekleşmiştir.

Sonuç: Açık kalp operasyonları başarılı ve kabul edilebilir morbidite ve mortalite oranları ile merkezimizde devam etmektedir.

Anahtar Kelimeler: Koroner baypas cerrahisi; açık kalp cerrahisi; yeni merkez

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INTRODUCTION

On May 6, 2018, we celebrated the 65th anniversary of the first successful open heart surgery. A Heart-lung machine, one of the most important invention in the history of cardiac disease, was used by John H. Gibbon, Jr., MD, of the Jefferson University Medical Center to close a large secundum atrial septal defect (ASD) in an 18-year-old woman[1]. Beginning with this surgery, generations of cardiac surgeons have been able to operate human hearts with efficiency and consistency to correct all types of cardiac disorders.

The first steps of modern cardiac surgery were taken in 1953 through closed mitral commissurotomy in Istanbul[2]. The first open heart surgery was performed by Dr. Mehmet Tekdogan in Hacettepe University Hospital. In the following years, with the great contributions of Dr. Kemal Beyazit, Dr. Yuksel Bozer, Dr. Siyami Ersek, and Dr. Cevat Yakut, the number of centers performing cardiac surgery has been increased. Initially, surgeries performed only in big cities have been successfully performed in many provincial centers in our country with the national coordination and action plans of the Ministry of Health[3,4].

The Sisli Hamidiye Etfal Training and Research Hospital was established as the first children's hospital in Turkey on June 5, 1899. One of the first x-ray machines has been used in this hospital, which has pioneered many innovations in the medical field[5]. The hospital, which is situated in one of the most densely populated area, boasts one of the largest patient admission capacities in Istanbul. In November 2014, a cardiovascular surgery department was established in Sisli Hamidiye Etfal Training and Research Hospital.

The aim of this article is to present the experience and results of the first 450 open heart surgeries performed in the Department of Cardiovascular Surgery at Sisli Hamidiye Etfal Training and Research Hospital, which is appealing to a dense population.

PATIENTS and METHODS

Records of the first 450 open heart surgeries performed between November 2014 and October 2019 in the Department of Cardiovascular Surgery at Sisli Hamidiye Etfal Training and Research Hospital were retrospectively evaluated by scanning the patient files and perfusion charts.

All patients with stable coronary artery disease (CAD) were treated with 100 mg/day of acetylsalicylic acid (Coraspin, Bayer, Istanbul) up to the preoperative day, and 75 mg/day of clopidogrel (Plavix, Sanofi-Aventis, Istanbul) was continued until the morning of surgery in cases taken during or after an acute coronary syndrome. The preoperative routine examinations, such as blood tests and chest x-rays were performed. In addition, all patients underwent bilateral carotid artery Doppler ultrasonography and pulmonary function tests. Patients with diabetes mellitus (DM) were referred to endocrinology consultations. In all diabetic patients, blood sugar levels were measured at 6-hour intervals. Oral antidiabetic therapy was discontinued and insulin treatment was initiated.

Dental examination was done routinely in patients who were scheduled for valve surgery.

In all cases, the surgeries were performed through median sternotomy. The standard cardiopulmonary bypass (CPB) technique was used in all patients who underwent coronary artery bypass grafting (CABG). Antegrade blood cardioplegia was given at 20-minute intervals to achieve a diastolic arrest of cardiac activity. In patients who underwent CABG, proximal anastomoses were performed under a side clamp, and sometimes, with single clamp technique depending on the patient characteristics. All patients were intubated and taken to the intensive care unit. After the chest tubes were withdrawn and positive inotropic drugs were discontinued, all patients were taken to the follow-up clinic from the intensive care unit on the second postoperative day.

Statistical Analysis

Minimum-maximum values and mean ± standard deviation were calculated using SPSS 15.0 software (SPSS, Chicago, IL, USA).

RESULTS

Preoperative Data

The mean age of the patients was 58.7 years (19-87 years). The most common comorbidity seen in the patients was hypertension (62.9%). Other comorbid diseases were DM (43.6%), hyperlipidemia (28.0%), chronic obstructive pulmonary disease (COPD) (24.9%), peripheral arterial disease (13.1%), and chronic renal dysfunction (4.7%) (Table 1).

The mean body mass index of the patients was 27.3 ± 3.2. The mean preoperative left ventricular ejection fraction was 45.0 ± 5.8.

To assess the risk of mortality (and to a lesser extent, morbidity), the European System for Cardiac Operative Risk Evaluation II (EuroSCORE II), a risk scoring system was used, and based on EuroSCORE II, 72 patients were found to be in the low-risk group, 236 patients in the medium-risk group, and 142 patients in the high-risk group.

Intraoperative Data

Isolated CABG was performed in 386 patients, aortic valve replacement (AVR) in 13 patients, mitral valve replacement (MVR) in 13 patients, and mitral valve repair with ring annuloplasty in 4 patients. Tricuspid ring annuloplasty was performed

Table 1. Demographic characteristics of patients

	Number of patients	%
Sex		
Female	91	20.2
Male	359	79.8
Hypertension	283	62.9
Hyperlipidemia	126	28.0
DM	196	43.,6
COPD	112	24.9
PAD	59	13.1
CKD	21	4.7
CVE	18	4.0

DM: Diabetes mellitus, COPD: Chronic obstructive pulmonary disease, PAD: Peripheral arterial disease, CKD: Chronic kidney disease, CVE: Cerebrovascular events.

Table 2. Case distribution

Operation	Number of cases	%
CABG		86.6
Isolated	382	
CABG + CEA	2	
CABG + LV aneurysm repair	2	
Off-pump CABG	4	
CABG + AVR	5	1.1
CABG + MVR	5	1.1
AVR	13	2.9
Isolated MVR	12	2.9
MVR + tricuspid ring annuloplasty	1	0.2
Mitral valve repair	4	0.9
Type 1 aortic dissection	11	2.4
ASD closure	4	0.9
Cardiac myxoma	5	1.1

CABG: Coronary artery bypass grafting, CEA: Carotid endarterectomy, AVR: Aortic valve replacement, MVR: Mitral valve replacement, LV: Left ventricle, ASD: Atrial septal defect.

in one patient who had MVR at the same session. Four patients were operated due to ASD, five due to cardiac myxoma, and eleven due to Type 1 aortic dissection (Table 2). In all patients, myxoma was removed together with the portion of atrial wall and the defect was primarily closed. ASD was repaired with a pericardial patch in all four patients. The mean aortic cross-clamp time (CCT) was 66.6 ± 29.7 minutes and CPB time was 128.0 ± 48.4 minutes, respectively.

Out of 400 patients who underwent CABG, 5 patients had MVR, 5 had AVR, 2 had carotid endarterectomy, and 2 had left ventricle aneurysm repair. Coronary artery endarterectomy was performed in four patients. The mean number of distal anastomoses was $3.1 \pm 1.5^{(1-5)}$. In seven cases, left internal mammary artery was not used due to the dissection with a number of five and mediastinal radiotherapy history with a number of two. Four patients underwent off-pump bypass surgery because of low ejection fraction (EF) and high-risk factors of CPB.

Preoperative and perioperative transesophageal echocardiography was routinely performed by cardiologists in patients who were scheduled for ASD, myxoma, and valve surgery.

Forty heart valves were intervened; six infective endocarditis patients underwent valve replacement with three mitral valve and three aortic valve involvements.

MVR was performed in 18 patients and mitral valve annuloplasty was performed in 4 patients. Mitral valve was reached by superior septal incision in patients with small left atrium and repaired through left atriotomy in other patients. AVR was performed in 18 patients and aortic root dilation was performed in 3 patients with narrow aortic root.

Five ascending aortic graft interposition and six supra-coronary hemiarch replacement was performed in Type 1 aortic dissection surgeries. Axillary artery was cannulated in 10 patients while femoral artery was chosen in only 1 patient. Total circulatory arrest (TCA) was used for these surgeries, and the mean duration of TCA was 28 minutes.

Postoperative Data

The patients who were taken to intensive care unit were extubated at a mean of 8.18 ± 3.6 hours. The mean volume of drainage was 820 ± 375 mL at postoperative Day 1. Atrial fibrillation (AF) was observed in 204 (45.3%) patients and normal sinus rhythm was achieved with amiodarone HCL (Cordarone, Sanofi-Synthelabo, Istanbul) treatment in 186 patients. Chronic AF was present in 18 patients.

Intra-aortic balloon pump was placed preoperatively in one patient, during surgery in four patients, and during intensive care unit follow-up in eight patients.

Five patients were supported on extracorporeal membrane oxygenation (ECMO) system. Indications for implementation of cardiac assist devices included postcardiotomy cardiogenic shock (two patients) and perioperative cardiac graft failure (three patients). Catheter-based revascularizations were successfully performed in two of three high-acuity patients temporarily supported by ECMO, and two patients survived to discharge.

Cerebrovascular disease was observed in one patient. Total occlusion of right middle cerebral artery developed and although percutaneous thrombectomy was performed, the patient died due to brain edema.

The length of stay in the intensive care unit was 1–6 days (mean, 3.36 ± 0.27 days), and hospital stay was 6–31 days (mean, 9.14 ± 1.51 days).

Morbidity

Low cardiac output, AF, reoperation for bleeding, sternal dehiscence, renal insufficiency, pneumonia, stroke, and prolonged endotracheal intubation were the most common serious postoperative complications (Table 3). Eight patients had reoperation for bleeding, and their medical treatment included dual antiaggregant drugs. Patients who survived after postoperative complications were discharged at 11.6 ± 2.83 days after surgery.

Mortality

The mean preoperative EF was 45.0 ± 5.8. Calculated EF in 76 patients was between 25% and 40%, and 228 patients had EF over 50%.

Table 3. Postoperative complications

Morbidity		Number of patients	%
	Atrial fibrillation	204	45.3
	Superficial wound infection (saphenous incision site)	18	4.0
	Sternal wound infection	4	0.8
	Mediastinitis	1	0.2
	Low cardiac output/Intra-aortic balloon pump and ECMO	13	2.9
	Renal Insufficiency required HD	2	0.4
	Revision due to bleeding	8	1.6
	Revision due to sternum dehiscence	4	0.8
	Chronic atrial fibrillation	18	4.0
	Cerebrovascular event	1	0.2
	Pneumonia	8	1.6
	Prolonged endotracheal intubation	34	7.5
MICUS (days)		3.36 ± 0.27	
MHS (days)		9.14 ± 1.51	

MICUS: Mean intensive care unit stay, MHS: Mean hospital stay, HD: Hemodialysis, ECMO: Extracorporeal membrane oxygenation.

Table 4. Mortality rates

		Number of patients	%
Total cases w/out AD	439	28	6.4
Aortic dissection	11	5	45.5
EuroScore			
Low-risk	72	4	5.6
Middle-risk	236	10	4.2
High-risk	142	19	13.4

AD: Aortic dissection.

Mortality was observed in 33 out of 450 patients who underwent open heart surgery, and the mortality rate was 7.3%. Five patients died after emergent surgery for Type 1 aortic dissection, thus, the overall mortality without dissection was 28 (6.4%). According to the EuroSCORE II, 19 patients belonged to the high-risk group, 10 patients belonged to the medium-risk group, and 4 patients belonged to the low-risk group (Table 4).

DISCUSSION

Today, cardiovascular diseases are the most important cause of death in the middle and old age groups and account for 30% of deaths worldwide[6]. The prevalence of coronary heart disease in Turkey varies between 4% and 5%, and the incidence varies between 0.3% and 0.4%[7].

With the advanced treatment modalities, diagnostic tools, and surgical techniques in the cardiovascular area, open heart surgery can be successfully performed in almost every new center after a transition period. During this period, we encountered several difficulties, such as limited number of experienced staff in the intensive care unit and operation room and insufficient multidisciplinary teamwork between the cardiovascular surgery and other departments. However, through clinical training and implementation of the standard and postoperative screening strategies and rotations, we have obtained successful outcomes.

Mortality rates differ according to the type and involvement of the surgery. As stated in literature, combined surgery is reported to have a higher mortality rate than isolated surgeries[8]. Combined procedures generally have a longer CCT, and in many studies, the length of this time has been associated with mortality. The mortality rate in isolated bypass surgeries performed with the diagnosis of CAD is 86.6% and in combined surgeries performed due to other diseases accompanying CAD is around 88.8%. In contrast, no significant difference was found in the mortality ratio when combined and isolated surgeries were compared in our study.

The mortality rate in patients who underwent elective and emergency surgeries significantly differed. It has been reported that the expected mortality rate in high-risk patients is 8.78 ± 3.54%[9]. In many studies, impairment of left ventricular systolic function has been reported to increase mortality, and in our study, a significantly higher mortality was found in patients with left ventricular dysfunction (lower EF). Based on the EuroSCORE II risk system, 378 patients (84.0%) were in the middle- and high-risk groups, and among them, the mortality rate was found to be 7.7%.

AF after cardiac surgery ranged from 15.0% to 44.0%[10,11]. Causes of AF in the postoperative period are variable and based on the type of surgery. In our study, AF was seen postoperatively in 204 (45.3%) patients. Out of these patients, only 18 (4.4%) had permanent AF despite all the medical therapy. Higher incidence rates are likely related to pre-existing comorbidities, such as COPD, distinct surgical stressors, and insults on the myocardium.

In a study by Beelchambers et al., incidence of sternal wound infection was reported to be between 1.0% and 8.6% after open heart surgery[12]. Sternal wound infection with dehiscence requiring reoperation occurred in 4 out of 450 patients, and among them, one patient had deep sternal infection. Surgical debridement of the sternum and mediastinum with reclosure, followed by mediastinal irrigation via drainage tubes with 0.5% povidone-iodine solution was performed.

It is known that cardiac surgery is performed with higher mortality and morbidity rates in elderly patients compared to younger patients. Now, when appropriate choices are made in patient selection and surgical procedures, surgeries of patients over 80 years old can also be performed with low mortality and morbidity rates[13,14]. In our study, no relationship was found between age and mortality, and no early mortality was found in patients over 80 years of age.

CONCLUSION

Mortality is within acceptable standards considering patients' comorbidities, reoperations, emergency coronary and dissections, mean EuroSCORE II and age profiles. Although

cardiac surgery department is newly established, it has become one where the most complicated cardiac and aortic surgery cases can be performed with reasonable morbidity and mortality rates in a very short time.

Ethics Committee Approval: Ethics committee approval has been received for this study from the Ethics Committee of Şişli Hamidiye Etfal Training and Research Hospital (Decision Number: 2813; Decision Date: June 02, 2020).

Informed Consent: Informed consent was obtained.

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REFERENCES

1. Hurt R. The history of cardiothoracic surgery from earliest times. London: The Parthenon Publishing Group, 1996:25-44.
2. Tokcan A, Yalınız H. Türkiye'de kalp cerrahisinin tarihçesi. Duran E (editör). Kalp ve Damar Cerrahisi. İstanbul: Çapa Tıp Kitabevi, 2004:13-20.
3. Aytaç A. Dünyada ve Türkiye'de kalp cerrahisi. Turk Gogus Kalp Dama 1991;1:8-12.
4. Kervan Ü, Özatik MA, Bayraktar G, Şener E, Çağlı K, Yekeler İ, et al. Distribution and service quality of the cardiovascular surgery clinics in Turkey. Turk Gogus Kalp Dama 2011;19:483-9.
5. Selçuk BA, Çolak C. Türkiye'nin ilk çocuk hastanesi; Hamidiye Etfal Hastane-i Âlisi. Lokman Hekim Journal 2012;2:11-4.
6. European Cardiovascular Disease Statistics. Erişim tarihi: Eylül 2012. Available from:https://www.bhf.org.uk/~/media/files/research/heart-statistics/european-cardiovascular-disease-statistics-2012.pdf
7. Kervan Ü, Koç O, Özatik MA, Bayraktar G, Şener E, Çağlı K, et al. Türkiye'deki kalp ve damar cerrahisi kliniklerinin dağılımı ve hizmetlerinin niteliği. Turk Gogus Kalp Dama 2011;19:483-9.
8. Orhan G, Aka SA, Aydoğan H, Filizcan U, Kaynarca N, Cömertoğlu Y, et al. Kombine koroner arter baypas greft ve kapak ameliyatlarında risk faktörleri. Turk Gogus Kalp Dama 1998;6:427-30.
9. Fındık O, Aydın U, Ay Y, Parlar H, Aksoy R, Şaşkın H, et al. Open heart surgery in Kocaeli Derince training and research hospital: evaluation of the first five hundred cases. Kosuyolu Heart J 2015;18:348.
10. Helgadottir S, Sigurdsson MI, Ingvarsdottir IL, Arnar DO, Gudbjartsson T. Atrial fibrillation following cardiac surgery: risk analysis and longterm survival. J Cardiothorac Surg 2012;7:87.
11. Büyükateş M, Turan SA, Kandemir Ö, Tokmakoğlu H. Zonguldak Karaelmas Üniversitesi Uygulama ve Araştırma Hastanesi'nde açık kalp cerrahisi: ilk 170 olgunun değerlendirilmesi. Turk Gogus Kalp Dama 2007;15:51-4.
12. Beelchambers J, Harris JM, Cullinan P, Gaya H, Pepper JR. A prospective study of wound infection in coronary artery surgery. Eur J Cardiothorac Surg 1999;15:45-50.
13. Alexander KP, Anstrom KJ, Muhlbaier LH, Grosswald RD, Smith PK, Jones RH, et al. Outcomes of cardiac surgery in patients age 80 years: results from the national cardiovascular network. J Am Coll Cardiol 2000;35:7318.
14. Pivatto F, Valle FH, Pereira EMC, Aguiar FM, Henn NT, Behr PE, et al. Long-term survival of octogenarian patients submitted to isolated coronary artery bypass graft surgery. Rev Bras Cir Cardiovasc 2011;26:21-6.