

## Coronary Artery Bypass Graft in Six Members of a Family: A Case Series

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### ABSTRACT

Coronary artery disease (CAD) is a multifactorial condition. Although hyperlipidemia (HLP), diabetes (DM), and hypertension (HTN) are known as familial and cardiac risk factors, coronary artery bypass graft (CABG) in several members of a family is rare. We reported the case of six members of a family who presented with myocardial infarction and/or advanced angina pectoris during six years. CABG was considered for all the patients due to involvement of the main coronary arteries and clinical presentations. Ejection fraction (EF) was varied between 25% and 70%. Beating heart cardiopulmonary bypass (beating heart CPB) and off-pump techniques were the surgical methods of choice. The mean duration of surgery was about 4 hours. The only post-operative complication was deep wound infection in a young man who was a smoker and drug abuser. Given the genetic relationship of the patients and the strong effect of genetic penetration, we presume the impact of genetics on the incidence of CAD and the probability of undergoing CABG in members of a specific family.

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## Introduction

Coronary artery disease (CAD) is a multifactorial condition (1). It has been known as a disease with high mortality and morbidity rates worldwide (2). When the perfusion and function of the heart are at risk, percutaneous coronary intervention (PCI) may be used for patient management (3). Coronary artery bypass graft (CABG) is the effective surgical technique in multivessel coronary disease (4). In the US only, the prevalence of CABG is more than 120,000 patients per year (5). According to patients'

conditions and their risk factors, beating heart cardiopulmonary bypass (beating heart CPB) or off-pump technique may be chosen (3) Although hyperlipidemia (HLP), diabetes (DM), and hypertension (HTN) are known as familial and cardiac risk factors, CABG in several members of a family is rare.

## Case Presentation

We aim to report progression to CABG in six members of a family during 2011-2017. Six

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members of a family were admitted to our hospital due to ischemic heart disease (IHD) or advanced angina pectoris, all of whom were referred to a cardiac surgeon for CABG.

#### **Case 1**

A 40-year-old female without any history of drug abuse and smoking presented with advanced angina pectoris. Three vessels involvement was shown by angiography. Her body mass index (BMI) was 31.5 kg/m<sup>2</sup>. The past medical history (PMH) was only hyperlipidemia. Ejection fraction (EF) was calculated 50% in her echocardiography report. She underwent CABG on 3<sup>rd</sup> January 2011. The three vessels were grafted by the off-pump technique, and her intubation time was 5.45 hours in the intensive care unit (ICU). The patient had drainage 300 cc and 470 cc on the first and the second 24 hours after the surgery, respectively. She was admitted to ICU for two days, and then stayed in cardiac surgery ward for six days.

#### **Case 2**

A 38-year-old male presented with advanced angina pectoris and three coronary vessels involvement proved by angiography. His BMI was 28.3 kg/m<sup>2</sup>, and no PMH of drug abuse and smoking was reported. The patient had EF of 58%. On 14th March 2011, CABG was performed by using the off-pump technique. The patient had drainage 600 cc and 250 cc on the first and the second 24 hours after the surgery, respectively. He was intubated for 4.35 hours in the ICU. He was in the ICU for two days and in the cardiac surgery ward for five days. Then, he was discharged without any problems.

#### **Case 3**

A 42-year-old male smoker and drug abuser presented with advanced angina pectoris and involvement of four coronary vessels as reported in angiography results. EF was computed 70% in echocardiography. His BMI was 22.45 kg/m<sup>2</sup>, and he had no PMH of any diseases. On 13th November 2011, beating heart CBP was carried out, which lasted for 2 hours, and the four vessels were grafted. The patient had drainage 250 cc and 280 cc on the first and the second 24 hours after the surgery, respectively. The patient was intubated for 5.35 hours. He was admitted to ICU for two days, and then stayed in cardiac ward for nine days. He was the only case who contracted deep sternal wound infection about 30 days later. Debridement was performed under anaesthesia. He was followed up for control of infection. He was discharged with his symptoms improved.

#### **Case 4**

A 61-year-old female smoker presented with myocardial infarction (MI). She had positive PMH for DM and HTN and her BMI was calculated at 28.1 kg/m<sup>2</sup>. EF was reported 40% in this patient and three coronary vessels were occluded. Therefore, on 26th May 2013, four grafts were placed through the beating heart CPB technique, which lasted for 2.35 hours. The patient had drainage 300 cc and 350 cc on the first and the second 24 hours after the surgery, respectively. She was intubated for 7 hours in the ICU. He stayed for two days in ICU and seven days in the general ward.

#### **Case 5**

A 64-year-old female with positive medical history of DM, HTN, and HLP presented with advanced angina pectoris, 25% EF, and involvement of two coronary vessels. Her BMI was calculated at 26.1 kg/m<sup>2</sup>. On 6th March 2017, two vessels were grafted by the off-pump technique. The patient had drainage 100 cc and 250 cc on the first and the second 24 hours after the surgery, respectively. She was intubated for 7 hours in the ICU. She stayed in ICU for two days and in the cardiac surgery ward for seven days.

#### **Case 6**

A 35-year-old female with the PMH of HLP presented with MI. Her BMI was 22 kg/m<sup>2</sup>. EF was 50% in echocardiography, and three coronary vessels were involved. On 25th June 2017, four CABGs were grafted within 3.5 hours by the off-pump CABG technique. The patient had drainage 400 cc and 450 cc on the first and the second 24 hours after the surgery, respectively. She was intubated for 7 hours and received one unit PC during the surgery. She was admitted to the ICU for three days and stayed in the general ward for eight days.

Two cases out of six were male and the remainder were female. The mean age of the patients was 46.6 years. The youngest and oldest members were aged 35 and 64 years, respectively, both of whom were female. Two female cases had DM and HTN and three female cases had HLP. The male patients had no PMH, only one patient was a smoker and drug abuser and developed deep sternal wound infection that was managed through surgery. CBC, liver function tests (LFT), BUN, Cr, and homocysteine were within the normal range. EF was more than 50% in all the patients, except for two older cases in whom EF was 25% and 40%. The mean duration of surgery was 4.41 hours. The mean hospitalization days was 7.6 days. Table 1 illustrates our findings.

**Table1:** demographic, clinical and surgical data

Case Number	1	2	3	4	5	6	
Demographic Data	Sex	Female	Male	Male	Female	Female	Female
	Age	40	38	42	61	64	35
	Weight	78	75	64	65	62	55
	Height	157	163	169	152	154	158
	Blood group	A+	B+	O+	A+	A+	O+
	Drug Abuse	No	No	Yes	No	No	No
	Smoking	No	No	Yes	Yes	No	No
	Date of Surgery	2011.1.3	2011.3.14	2011.11.13	2013.5.26	2017.3.6	2017.6.25
Para clinical Findings	Diabetes	No	No	No	Yes	Yes	No
	Hypertension HTN	No	No	No	Yes	Yes	No
	Hyperlipidemia HPL	Yes	No	No	No	Yes	Yes
	MI	No	No	No	Yes	No	Yes
	HF	No	No	No	No	No	No
	CBC	In Normal Range	In Normal Range	In Normal Range	In Normal Range	In Normal Range	In Normal Range
CABG DATA	BUN, Cr	BUN= 19 Cr= 0.6	BUN= 20 Cr= 0.7	BUN= 29 Cr= 0.9	BUN= 27 Cr= 0.7	BUN= 24 Cr= 0.1.1	BUN= 21 Cr= 0.7
	Homocysteine	Normal	Normal	Normal	Normal	Normal	Normal
	% EF	50	58	70	40	25	50
	Angiography Report	3VD	3VD	4VD	3VD	2VD	3VD
Number of Graft	3	3	4	4	2	4	
On/Off Pump	Off Pump	Off Pump	On Pump	On Pump	Off Pump	Off Pump	
CPB Time	-	-	2	1.35	-	-	
Post Operation Data	First 24 hours derange(cc)	300	600	250	300	100	400
	Second 24 hours derange(cc)	470	250	280	350	250	450
	Post Op Complications	None	None	Deep wound infected	None	None	None
	Post Op BUN / Creatinine	BUN= 20 Cr= 0.7	BUN= 17 Cr= 0.8	BUN=40 Cr= 0.9	BUN= 39 Cr= 1	BUN= 21 Cr= 1.2	BUN= 24 Cr= 0.8
	Intubation Time (hours)	5.45	4.35	5.35	7	7	7
	ICU Hospitalization Time (day)	2	2	2	2	2	3
	Hospitalization Time (day)	8	7	9	7	7	8

## Discussion

Although CAD is a multifactorial condition, progression to CABG in six members of a family is rare. CAD is the leading cause of mortality all over the world (3). Presentation of CAD is due to the interaction of gene penetration and environmental factors (6). In 40-60% of cases, positive family history of CAD has been found (6). CAD occurs following endothelial dysfunction (7). Various risk factors such as high LDL-cholesterol, diabetes and high blood pressure have been linked to coronary heart disease in the literature. However, genome composition may change the disease risk and with the interactions between genes and the environment, these factors may be important in progression of the disease. Control of the risk factors and medication therapy improve endothelial function (7). Strict management should be performed in smokers and patients with positive family history, HTN, DM, HLP, and obesity (8). The onset of risk factors and their poor management can induce progressive symptoms even in young ages (9). We report the case of six members of a family in different age groups who had varied risk factors

like smoking, drug abuse, HTN, HLP, and MI and different numbers of coronary angiography coronary vessels involved. Coronary angiography is a two-dimensional assessment performed to detect coronary occlusion (10).

Gene mapping and determination of susceptible genes in CAD would provide new insight into the main causes of CAD. However, we did not test the susceptible genomes and mutation in these patients, but lymphotoxin alpha (LTA), lectin galactoside-binding soluble 2 (LGALS2), and Arachidonate 5-lipoxygenase-activating protein (ALOX5AP) are known (11). According to American Heart Association/American College of Cardiology, CABG is recommended when we prove to have more than 50% stenosis in the left main coronary artery and observe more than 70% stenosis in the left anterior descending coronary artery, involvement of more than three vessels, and stenosis of one or two vessels in symptomatic patients (12, 13). In CABG, the use of left internal thoracic artery and saphenous vein grafts are more common than grafts in the radial artery, the right internal thoracic artery, and the

gastroepiploic artery (12). Normally, according to patient condition, CABG takes about 3 to 4 hours (12). Currently, the least invasive surgical techniques are used for CABG (14). Two acceptable techniques for CABG are off-pump and on-pump. The off-pump technique is less invasive than CPB. The most important advantage of off-pump CABG is the prevention of cardiac arrest (16). Thus, we chose the less invasive techniques. Even if a patient who is a candidate for non-cardiac surgery, has no coronary heart disease symptoms but has multiple cases of coronary heart disease in the family, anaesthesiologists need to consider the possibility of heart disease and perform the necessary tests.

## Conclusion

The present study reported the rare case of a family who had severe involvement of coronary arteries during six years and progressed to CABG. The patients were in different age groups and with various risk factors. However, according to the family relationship of the patients and the high impact of genetic penetration, we presume the effect of genetics on the incidence CAD and the probability to undergo CABG.

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None.

## Conflict of Interest

The authors declare no conflict of interest.

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