DOI: https://doi.org/10.53350/pjmhs22166860

ORIGINAL ARTICLE

Clinical Presentation of Pleural Effusion Among Patients after CABG and its Prevalence

IQTIDAR-UD-DIN[1], MUHAMMAD ABDUR RAUF[2], YASIR ARAFAT[3], IMRAN KHAN[3], BILAL MUSTAFA[4], TANVEER AHMAD[3]
[1]*Assistant Professor Cardiology Qazi Hussain Ahmad Medical Complex/ Nowshera Medical College, Nowshera*
[2]*Assistant Professor Cardiology, Kuwait Teaching Hospital/ Peshawer Medical College, Peshawar*
[3]*Senior Registrar, Qazi Hussain Ahmad Medical Complex/ Nowshera Medical College, Nowshera*
[4]*Assistant Professor Cardiology, Dr Akbar Niazi Teaching Hospital, Islamabad*
Corresponding author: Iqtidar Uddin, Email: iqi_kmc@yahoo.com

ABSTRACT

Objective: Pleural effusion often occurs after CABG. Usually, this effusion is slight and asymptomatic. There is also high symptomatic effusion, but in a small percentage of patients. Pleural effusion after CABG may be associated with significant morbidity and prolonged hospital stay. Early diagnosis and treatment can reduce morbidity of patients and extent of hospital stay.

Aim: The aim of the study is to determine the risk factors and the severity of pleural effusion in patients after CABG.

Place and Duration: In the Cardiology department of Qazi Hussain Ahmed Medical Complex, Nowshera for six-months duration from July 2020 to December 2020.

Material and methods: The study was held among 120 patients after meeting the inclusion criteria and selected for the study. Patients were included in study population before referral for CABG from QHAMC to multicenters of Khyber Pakhtunkhwa. Their records were closely followed during admissions for CABG and post CABG and also assessed on various follow up visits. The study procedure was described to the patient and informed consent was obtained. Demographics, name, age, gender, surgery details, comorbidities such as COPD, EF and smoking were recorded on the attached form. The patients stayed in the intensive cardiac surgery unit for at least 7 days. The presence and severity of pleural effusion was assessed on the CXR. A chest x-ray was done on daily basis and evaluated by a chest specialist in the morning round. The amount of effusion in CXR was classified as follows: low effusion covering less than half of the chest, high effusion covering more than half of the chest. Possible risk factors for the development of pleural effusion in post-CABG patients have been reported.

Results: The majority 99(82.5%) of the 120 subjects who had pleural effusion done with CABG were male. The patients mean age was 55.28 ± 10.47 years. Most patients 93(77.5%) had left pleurotomy. LIMA harvesting was reported in 98(81.7%) of patients. Most patients 100(83.3%) had left sided pleural effusions and 5(4.2%) had right sided and bilateral pleural effusions in 15(12.5%) of cases. A total of 102 patients (85%) had low (less than half of the chest) pleural effusion and large symptomatic pleural effusion in 18(18%) (more than half of the chest). 104 patients (86.7%) required pleural aspiration. Most of the patients 110(91.7%) had decreased serum albumin. Of the patients requiring effusion aspiration, 46 (38.3%) had dyspnea, 18 (15.0%) cough, 34 (28.3%) ABGs abnormalities, and 8 (7.7%) had atelectasis. Preoperative EF was normal in 80 (66.7%) patients, but poor EF was present in 50 (33.3%) patients on the 7th postoperative day.

Conclusion: A slight left-sided effusion developed in the majority of patients after CABG. There was also large size of pleural effusion, but occurs in small extent. The effusion mainly causes some respiratory symptoms that require pleural aspiration. LIMA harvesting, pleurotomy and hypoalbuminemia were the main risk factors for pleural effusion in patients after CABG.

Keywords: CABG = coronary artery bypass grafting, LIMA = Left internal mammary artery, CXR = chest X-ray, ICU = intensive care unit, COPD = chronic obstructive pulmonary disease and EF = ejection fraction.

INTRODUCTION

CABG is accomplished on more than 6 million patients in the USA each year[1]. Patients often had pleural effusion related directly to this surgical procedure, causing this practice as the communal reasons of pleural effusion[2-3]. Within the week following CABG, the testified occurrence of pleural effusion ranged from 41% to 87%[4]. Most effusions are small, unilateral, left-sided, and asymptomatic. These effusions usually disappear gradually over a period of several weeks. However, some CABG patients develop moderate to severe effusions that sometimes cause symptoms. Major pleural effusions occur in the early postoperatively duration with a frequency of 0.6-8.7%[5-6]. There are 2 types of pleural effusions that are related directly to CABG after surgery: atelectasis effusion due to diaphragmatic dysfunction and haemorrhagic effusion from harvesting of internal mammary artery (IMA). In addition, pleural effusion may occur after CABG due to congestive heart failure[7]. These pleural effusions are related with various clinical, pathophysiological analytical features of the pleural fluid (PF), sequelae and management[8]. PE resulting from diaphragmatic dysfunction are usually identified by radiographs. The effusions are small and the left side is accompanied by atelectasis on the same side; Thoracentesis is infrequently completed in these effusions and treatment is conventional[9]. These pleural effusions frequently spontaneously resolved in two-weeks without clinically worsening. However, compared to CABG / CPB, OPCAB provided earlier extubation and better gas exchange but did not differ in spirometry, chest radiographs, pneumonia, and pleural effusion. Moreover, prolonged intraoperative time is linked with high frequency of PE as pleural trauma during surgery is related with this progression[10]. In addition, other phenomena associated with a longer duration of surgery, such as blood transfusion, endothelial damage, and an inflammatory response, may contribute to the development of this complication[11]. The usage of graft of IMA results in a high occurrence of pleural effusion on the same side as compared to the saphenous vein graft (88% versus 46% on 6th day postoperatively). These effusions often occur similarly to effusions due to diaphragmatic dysfunction; Fluid seems in the instantaneous period perioperatively, is generally small, is on the same side of the IMA removal, and may be associated with atelectasis[12]. This study was designed to evaluate patients at risk of pleural effusion as well as to determine the severity of the effusion requiring pleural aspiration[13]. The results of this study will highlight patients at risk of pleural effusion. and allowing ICU consultant physicians / physiotherapists to intervene early to reduce patient morbidity and hospital stay after CABG.

METHODS

The study was conducted in the the Cardiology department of Qazi Hussain Ahmed Medical Complex, Nowshera for six-months duration from July 2020 to December 2020. Patients were included in study population before referral for CABG from QHAMC to multicenters of Khyber Pakhtunkhwa. Their records were closely followed during admissions for CABG and post CABG and also assessed on various follow up visits. The study design was cross-

sectional descriptive and the sampling technique used was consecutive sampling. The study included patients of both sexes who underwent CABG and developed pleural effusion. However, patients who did not have pleural effusion or who had documented pleural effusion prior to surgery for any cause, such as renal failure, heart failure, or respiratory failure, were excluded from the study. The study included 120 patients after meeting the inclusion criteria, the study procedure was explained to the patient and informed consent was obtained. Demographics, name, age, gender, surgery details, comorbidities such as COPD, EF and smoking were recorded on the attached form. The patients stayed in the intensive cardiac surgery unit for at least 7 days. The presence and severity of pleural effusion was assessed on the CXR. A daily chest x-ray was done and examined by a chest specialist in the morning session. The amount of effusion in the CXR was classified as follows: small effusion covered less than half of the chest, while high effusion comprised more than half of the chest. Potential risk factors for the development of pleural effusion in CABG patients, such as removal of LIMA, intact / open pleura, pumped / pumped out, time of surgery, number of blood transfusions, and number of SVGs have been reported. Data was entered and analyzed with SPSS version 22.0. All quantitative variables were articulated as standard deviation (SD) and mean, while qualitative variables (gender, DM, smoking, on pump, off-pump, effusion, dyspnoea, cough, ABG) were presented as frequency, percentage, and pie-charts.

RESULTS

The total sample unit included in this study was 120. The patients mean age was 55.28 ± 10.47 years, and 98 (81.7%) were male.

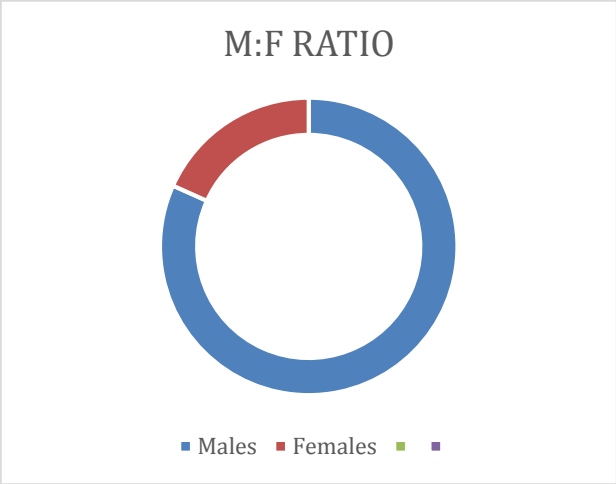

Figure 1:

Diabetes was diagnosed in 45 (37.5%) patients. 40 (33.3%) were smokers. 31 (25.8%) had COPD. The LIMA harvest was reported as 90 (75.0%). Of the patients who underwent off-pump surgery were 12 (10%) and 108 (90%) patients were operated with on-pump. Blood transfusions ranged from 1 to 5 bags. An open pleura was found on the left side in the vast majority of 86 (71.7%) patients, while on both sides in 25 (20.8%) patients, no open pleura was found in 9(7.5%) patients. According to CXR, 38 (31.7%) had left pleural effusion, only 2 had right sided PE, and 8 - bilateral pleural effusion on day 3 (Table 1).

Table 1: Combined Pleural Effusion

	Right	Left	Both	No	Total
Day 3	1.7%	31.7%	6.7%	59.9	100%
Day 5	2.5%	25.8%	4.2%	67.5%	100%
Day 7	1.7%	12.5%	1.7%	84.3%	100%
Total	5.9%	70%	25.6%		

On the fifth day, 31 (25.8%) had left sided pleural effusion, 5 bilateral, and 3 had right sided pleural effusion. On the seventh day, left side pleural effusion was seen in 15 patients (12.5%), and right sided PE in 1 patient and bilateral effusion in one patient. Most patients 100(83.3%) had left sided pleural effusions and 5(4.2%) had right sided and bilateral pleural effusions in 15(12.5%) of cases. A total of 102 patients (85%) had low (less than half of the chest) pleural effusion and large symptomatic pleural effusion in 18(15%) (more than half of the chest). (Table 2).

Table 2: Size of Pleural Effusion

Size of Pleural Effusion	Frequency	Percent
Less than mid chest	102	85.0
More than mid chest	18	15.0
Total	120	100.0

104 patients (86.7%) required pleural aspiration. Most of the patients 110(91.7%) had decreased serum albumin. Of the patients requiring effusion aspiration, 46 (38.3%) had dyspnea, 18 (15.0%) cough, 34 (28.3%) ABGs abnormalities, and 8 (7.7%) had atelectasis. Preoperative EF was normal in 80 (66.7%) patients, but poor EF was present in 50 (33.3%) patients on the 7th postoperative day.

DISCUSSION

CABG is accomplished on more than 6 million patients in the USA each year. Patients often had pleural effusion related directly to this surgical procedure, causing this practice as the communal reasons of pleural effusion[14]. This study shows the incidence of small and large symptomatic pleural effusions in the first week after CABG[15]. In the week subsequently to CABG, the stated incidence of PE ranges from 41% to 87%. Most effusions are small, unilateral, left-sided, and asymptomatic. These effusions usually disappear gradually over a period of several weeks. However, some CABG patients develop moderate to severe effusions that sometimes cause symptoms[16]. Major PE occur in the early postoperatively duration with a frequency of 0.6-8.6%. The incidence is somewhat dependent on the method used to detect pleural effusion. Most patients 100(83.3%) had left sided pleural effusions and 5(4.2%) had right sided and bilateral pleural effusions in 15(12.5%) of cases. A total of 102 patients (85%) had low (less than half of the chest) pleural effusion and large symptomatic pleural effusion in 18(15%) (more than half of the chest), comparable to previous studies. Aarino et al. Assessed the pleural effusions incidence occurring in 50% to 75% of patients in the first week after CABG surgery in 200 patients who received IMA graft and found that 8.6% needed a thoracocentesis instantly later to operation[17-18]. After three-months, pleural effusion was seen in 20% of cases and 1% required a chest intubation only. Landymore and Howell described that not a single person of their 68 patients needed a thoracentesis during the 3-month follow-up[19-20]. None of the three researches explained the characteristics of the pleural fluid. In our study, patients had symptoms of pleural effusion, such as cough, dyspnoea, atelectasis, and abnormal ABG, and were treated with therapeutic breast puncture. Most patients (73%) were treated conservatively with anti-inflammatory drugs, diuretics, non-invasive CPAP mask ventilation or deep breathing exercises (stimulating spirometry)[21-22].

The size of the research sample was small compared to other international studies; In addition, the results of our study cannot be used in the general population as it is one hospital study. However, it provides important data on pleural effusion in patients after CABG admitted to the ICU.

CONCLUSION

Taken together, this study results presented a high rate of pleural effusion in the first week of CABG surgery. After CABG, most patients develop a slight (less than half of the chest) pleural effusion on the left. However, there is also a large pleural effusion (more than half of the chest) but in a small fraction of the

population. Small pleural effusions can be treated with anti-inflammatory drugs, diuretics, non-invasive CPAP mask ventilation, or by encouraging patients to perform deep breathing exercises such as stimulating spirometry. Large symptomatic effusions require treatment with thoracocentesis. The most common risk factors for pleural effusion are LIMA removal, pleural opening, and hypalbuminaemia. Early diagnosis and effective treatment can reduce patient morbidity and post-CABG hospital stay.

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