FREQUENCY OF INCREASED FIBRINOLYSIS AFTER CORONARY ARTERY BYPASS GRAFTING

Nosheen Ali, Mohammad Ayyub, Saqib Qayyum Ahmed*, Maha Anis Alam

Armed Forces Institute of Pathology Rawalpindi Pakistan, *Army Medical College, National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To determine the frequency of increased fibrinolysis after coronary artery bypass grafting (CABG).

Study Design: Descriptive study.

Place and Duration of Study: One year duration conducted in the Department of Pathology, Army Medical College in collaboration with Armed Forces Institute of Cardiology (AFIC) from December 2013 to November 2014.

Material and Methods: Sixty patients were selected who were admitted to AFIC for CABG surgery. Venous samples were drawn from the patients immediately after surgery when the patients were shifted to post operative ward. Patients were selected by non probability purposive sampling technique. D-dimers were analysed by rapid agglutination assay.

Results: Out of 60 patients included in the study, 50 (83.3%) were males and 10 (16.7%) were females. D-dimers level more than 200ng/ml were considered to show increased fibrinolysis. Raised D-dimers were present in 40 (66.6 %) patients while they were normal in 20 (33.3 %) patients.Twenty (33.3%) patients had D-dimers<200ng/ml, 27 (45%) patients had D-dimers between 200-400ng/ml, 7 (11.7%) patients had D-dimers between 400-800ng/ml and 6 (10%) had D-dimers between 800-1600ng/ml.

Conclusion: Increased fibrinolysis was present in 40 (66.7%) patients. It is more common in older age than younger ones.

Keywords: Bypass Grafting, Coronary Artery, Fibrinolysis.

INTRODUCTION

Coronary artery diseases (CAD) are one of the major causes of mortality and morbidity[1]. The most common procedure carried out for these diseases is coronary artery bypass grafting (CABG) and almost 800,000 cases are done annually word wide[2]. One of the complications after CABG is postoperative mediastinal bleeding. Excessive bleeding and the need for transfusion after CABG plays an important role in post CABG mortality and morbidity[3-5]. Cardiac surgery patients still receive more blood transfusions than any other surgery and consume almost 20 percent of bank reserves [5]. Blood transfusion can cause hypersensitivity reactions and infections which can increase the hospital stay[6]. Reopening thoracotomy is done in 2-7 percent of cases to arrest bleeding[7].The causes of post CABG bleeding include dilutional coagulopathy, thrombocytopenia, platelet function defects, administration of heparin during bypass and excessive fibrinolysis[4]. Fibrinolysis is responsible for bleeding in about twenty five to forty five percent of CABG cases[7].

Postoperative bleeding after CABG may results due to abnormal activation of hemostatic system and can lead to consumption of coagulation factors, increased fibrinolysis and destruction of platelets [3,10,14]. Aim of the study is to see the frequency ofpost operative increased fibrinolysis, in patients subjected to CABG procedure in order to determine the proportion of patients with deranged haemostasis, who are at risk of developing post CABG bleeding.

MATERIAL AND METHODS

The study was conducted in Pathology department, Army Medical College Rawalpindi in collaboration with Armed Forces Institute of Cardiology (AFIC). The duration of study was 12 months from October 2013 to September

Correspondence: Dr Nosheen Ali, House No. 36, Askari II, COBB Lines, Near Qasim Market Rawalpindi, Pakistan
Email: anosheen65@yahoo.com
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2014. All patients, both males and females, admitted for CABG surgery during the period of study were included. Patients known to be suffering from bleeding disorder were excluded from the study. A total of sixty samples were included in the study by non probability purposive sampling technique.

The study was commenced after approval from ethical review committee of Army Medical College and ethical review board of AFIC. Written consent was taken in each case. The patients were selected for surgery after their examination and admission to AFIC by a cardiac surgeon. Two ml venous blood sample was drawn from each patient in the postoperative ward immediately after being shifted from the operation theater. Blood samples were analyzed for D-dimers. The patients having D-dimers more than 200 ng/ml were considered positive for increased fibrinolysis.

Data was analyzed using SPSS version 20. Descriptive statistics were used to describe the data that is mean and standard deviation for quantitative variables while frequency and percentages for qualitative variables.

RESULTS

A total of 60 patients were included in the study. The patients were admitted for CABG surgery by cardiac surgeon. Fifty (83.3%) were males and ten (16.7%) were females (Table-1). Mean age of patients was 56.5 years (SD=14.27) with minimum age of 32 years and maximum age of 89 years (Table-2). Raised D-dimers were present in 40(66.6%) of 60 patients. Distribution of patients into various age groups along with frequencies of patients with increased fibrinolysis in each age group is shown in table-2. Distribution of patients into the groups with various levels of raised D-dimers is shown in fig-1.

Table-1: Showing gender distribution of patients.

Total patients	Males	Females
n=60	50 (83.3%)	10 (16.7%)
Increased fibrinolysis	36 (72%)	4 (40%)

Table-2: Showing age distribution of patients.

Number N=60	Male	Female	Increased fibrinolysis	Age of patients
22 (36.6%)	14 (63.3%)	8 (36.3%)	(54.55%)	30–50 years
38 (63.3%)	36 (94.7%)	2 (5.26%)	28 (73.68%)	>50 years

DISCUSSION

Physiological fibrinolysis is a normal or appropriate localized haemostatic response to vascular injury and local thrombosis; and is necessary for re-establishment of blood flow. Tissue plasminogen activator (tPA) released by the vessel wall converts plasminogen, a proenzyme in blood and tissue fluids, into plasmin which results in dissolution of fibrin clot within the circulation.

During excessive or pathological fibrinolysis, plasmin breaks down the fibrin meshwork and releases a number of soluble fibrin degradation products (FDPs), which interfere with the coagulation system, inhibit the platelet function and compete with thrombin, and slow down the clot formation by

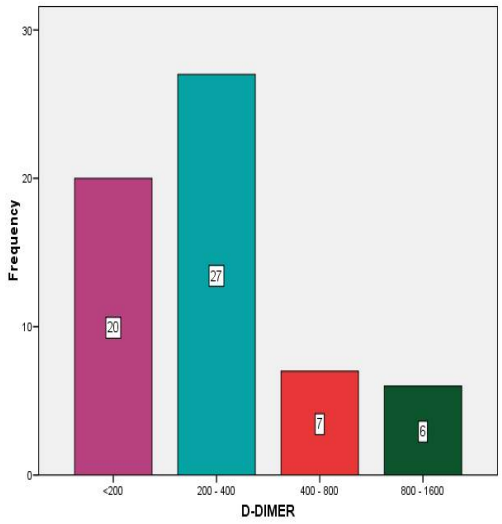

Figure-1: Description of D-dimer result among patients (n=60).

preventing the conversion of fibrinogen to fibrin; all contributing to bleeding tendency[8].

Excessive fibrinolysis can either be primary or secondary. Primary fibrinolysis or fibrinogenolysis involves increased fibrinolytic activity because of the imbalance between plasmin and antiplasmins in favour of the former. Hyper-fibrinogenolysis has been reported in various pathologic conditions such as liver disease, disseminated urogenital neoplasms, CABG, hypotension, trauma and heatstroke.

Secondary fibrinolysis occurs as a result of activation of coagulation and thrombin generation, which stimulates endothelium to produce increased amount of tissue plasminogen activator which in turn cause increased fibrinolysis.

CABG may also be associated with intense activation of hemostatic mechanisms which result in release of tissue factors that cause excess thrombin generation, this results in fibrin formation, platelet activation and fibrinolysis even after full heparanization[9-13] . This process starts with the skin incision and continues afterwards. Due to the contact of blood with large surface area of bypass circuit there is intense activation of hemostatic mechanism. There is increased fibrinolysis after CABG which may be due to increased generation of tPA after the bypass[15]. This results in activation of fibrinolytic system which causes consumption of platelets and dissolution of fibrin clot as a result of which the patient can develop serious bleeding[12]. Thrombin production during the bypass causes hemostatic dysfunction resulting in consumption of platelet and clotting factors and may cause abnormal platelet function and subsequently increased fibrinolysis[14].

The outcome of heart surgery is complicated by hemorrhagic perioperative and postoperative syndromes, because of this reason the variables of coagulation and fibrinolysis are extensively investigated. In present study sixty patients were included, among those D-dimers were increased in 40(66.7%). Although increased fibrinolysis were seen in a higher percentage of females as compared to males in our study a but the difference was not statistically significant.

Ray et al also found that there are increased D-dimer levels in the post bypass period[16] CABG surgery with CPB is associated with intense activation of hemostatic system as compared to CABG performed off-pump[17]. Another study conducted by Casati et al also showed the similar transient increase in D-dimer levels in the immediate postoperative period in surgeries performed on pump, however in contrast to present study, that study measured the D-dimer levels up to 24 hours after surgery[18]. Elderly age is one of the risk factors for post CABG bleeding. Pleym et al studied increased fibrinolysis and platelet activation in elderly patients undergoing CABG surgery. In their study they concluded that there is increased activation of coagulation and more extensive fibrinolysis postoperatively in elderly patient as compared to the young patients[19]. We also found increased fibrinolysis more frequently in patients more than 50 years of age as compared to younger patients (Table-2).

CONCLUSION

In the present study frequency of increased fibrinolysis was 66.7 percent post operatively in patients undergoing CABG. After CABG there is a transient increase in D-dimers with a net consumption of platelets and fibrinogen as a result of which the patient can develop serious postoperative bleeding. With these parameters we can timely identify the patients who are at the risk of developing postoperative bleeding and this may help to reduce mortality and morbidity associated with CABG.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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