

INCIDENCE RISK OF STROKE AFTER CORONARY ARTERY BYPASS GRAFTING (CABG)

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ABSTRACT

Objective: “To determine the incidence risk of stroke after Cardiopulmonary Bypass Grafting (CABG) in Lady Reading Hospital Peshawar.”

Methodology: The cross-sectional quantitative project was undertaken in the Cardiovascular Surgery Department of Lady Reading Hospital, KPK, Pakistan (LRH). The period of this study was six months. Data was collected from two hundred and twenty-one patients who were participants of the study. SPSS version 14 was used for data analysis. Stroke was stratified by gender and age to see the stratal effects. A p-value of less than 0.05 was taken as significant in the chi-square test after data stratification.

Results: Two hundred and twenty one patients who had CABG in the cardiology unit of LRH were included in our study. The gender distribution of the participants was 1.63:1 male to female with the average age of the participants being 64.79 years +7.79SD with a range of 50-80 years. The stroke in patients after CABG was observed in 17(7.69%).

Conclusion: We found in our study that the incidence of post-CABG stroke is common after 55 years of age. Whereas stroke incidence increases further in patients who get an MI within a day of surgery.

Keywords: Ageing, atherosclerosis, CABG, stroke

INTRODUCTION

There have been great developments in anesthesia and cardiac surgery techniques recently. Despite these developments, stroke remains the most observed iatrogenic neurological complication after myocardial revascularization. The incidence of this complication is associated with increased morbidity and mortality rate in patients. This complication lead to incurring more cost to the health care systems through prolonged hospital stays as well as outpatient rehabilitation. A big percentage of patients who undergo coronary artery bypass grafting (CABG) show adverse neuropsychological complications.

Thus, stroke post CABG surgery is a very serious health issue and it is highly required to assess the pre-operative risk factors associated with postoperative stroke. The incidence of post-CABG stroke is between 1.3 and 4.3%^{1,2}.

Many intra-operative and peri-operative factors predict the likelihood of post-CABG stroke. Diabetes, hypertension and older age are associated with a risk of post-CABG neurological complications. Atrial fibrillation, aortic atherosclerosis, calcific disease, bilateral carotid artery disease have also been increasingly correlated with a higher incidence of post CABG neurological adverse presentations. Preoperative neurological event, cross-clamping the aorta intermittently during surgery and mural thrombosis are the co-factors that increase the risk of neurological damage after CABG¹.

In a study conducted by Naylor AR et al³ reported that the higher number of revascularized arteries was associated with the incidence of stroke post-CABG (p=0.01). There was difference in risks of intraoperative stroke depending upon the various surgical techniques that were used. Patients who had on-pump CABG with CVAs were among the patients with the highest unadjusted rates of stroke (5.3 percent). The least rate of stroke as 0.14 percent and zero percent respectively were reported with Off-pump CABG and in on-pump beating-heart CABG. Patients

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undergoing on-pump arrested-heart CABG were found to have an intermediate risk (0.50 percent) of intraoperative stroke. Greater complications are reported in cases that get a stroke during surgery⁴.

In another study conducted by Nasreen A⁵ in Karachi, Pakistan; a total of 80 (100%) patients underwent conventional CABG. There were 30 (37.5%) female patients with a no-touch technique, having the mean age of 64.6±2.1 years. Postoperative stroke was found in 03 patients (3.75%). In another study reported a 7.6% incidence of stroke after surgery⁶.

Postoperative stroke disease is very commonly found in our society and many of these patients undergo CABG. Post CABG stroke is not an uncommon complication after this surgery and if not diagnosed and treated in time, leads to further complications in already critical patients and has a higher mortality rate. The Purpose of this research is to give us evidence specific to our local population of stroke after CABG and along with it the common factors leading to stroke after CABG. These results will be used to make certain recommendations and suggestions for the identification and if possible better control of the factors pre-operatively which will ultimately reduce the stroke in the post-operative period.

OBJECTIVE

“To determine the incidence risk of stroke after Cardiopulmonary Bypass Grafting CABG in Lady Reading Hospital Peshawar”.

OPERATIONAL DEFINITION

Stroke: A sudden onset of focal/global neurological deficit that lasts >24 hours which is caused by either vascular blockage or rupture of a vessel supplying an area of the brain and is confirmed by C. T brain⁷. C. T brain will be characterized by hyper-dense (high density or white) lesions in case of hemorrhagic stroke whereas in ischemic stroke it will be characterized by hypodense (low density) lesions. It was considered if occurs within seven (7) post-operative days.

METHODOLOGY

The research was conducted based on a descriptive cross-sectional design for quantitative studies.⁷ The research was conducted in LRH, Peshawar. The period of this study was six months. Data was collected from two hundred and twenty-one patients who were participants of the study. The sample size of 221 cases was calculated using 5% expected frequency of post-CABG stroke, 95%

confidence interval, 3.5% margin for error, using of WHO sample size calculator. The sampling technique employed was that of Nonprobability consecutive sampling⁸.

Patients with CAD (double and triple vessel disease and/or main left stem disease) undergoing CABG were recruited. Both male and female patients were included.

Chronic obstructive pulmonary disease patients as diagnosed by FEV₁ / VC ratio less than 70% predicted value were excluded from the study. Chronic renal failure patients as diagnosed by serum creatinine level above 200 µmol/l were also excluded from the study. Patients with Rheumatic heart disease detected by echocardiography were also excluded. Patients with the above-mentioned conditions were excluded to avoid confounding.

Data collection procedure

Approval from hospitals research and ethical board of LRH was obtained for the research. All patients meeting the inclusion criteria (patients with the double vessel, triple vessel or left main stem disease diagnosed by coronary angiography) was enrolled in the study through OPD and was admitted in the cardiovascular surgery department of the hospital for further workup.

Participants of the study were informed about the aims and objectives of the research after which written informed consent was obtained. All participants of the study went through a comprehensive history taking and clinical examination which was followed up with routine pre-operative investigations. All the participants were put on the next OT list for coronary artery bypass grafting as per standard protocols.

All patients had a standard CABG done by the same consultant and team of cardiovascular surgeons having a minimum of seven years of experience. Postoperatively all patients were observed daily till 6th post op day to detect stroke and once detected common factors leading to it was scrutinized i.e. recent AMI, significant carotid artery disease, diabetes mellitus, prolonged aortic cross-clamp time and past history of atrial fibrillation.

Strict adherence to the exclusion criteria was observed during the research to control confounders and bias in the results of this study.

DATA ANALYSIS PROCEDURE

SPSS version 14 was used for data analysis. Mean and SD were calculated for quantitative variables. Frequency and percent values were

calculated for categorical variables. Stroke was stratified among age and gender to see the effect modifications. A p-value of less than 0.05 was taken as significant in the chi-square test after data stratification. All results are presented in the form of tables and graphs.

RESULTS

Two hundred and twenty one patients who had a CABG in the cardiology unit of LRH were recruited. The gender distribution of the participants was 1.63:1 male to female with 138 (62.44%) being males and 83(37.56%) being females (Fig 1).

The average age of the participants being 64.79 years +7.79SD with a range of 50-80 years. The participants were divided into four categories based on their age, out of which most common age group for patients after CABG was 66-75 years. There were 24(10.86%) patients aged less than 55 years. Eighty-four (38.01%) patients were in the age range of 56-65 years,

98 (44.34%) were of age range 66-75 years and 15(6.79%) presented at age more than 75 years of age (Fig 2).

Stroke in patients after CABG was observed in 17(7.69%) while in 204(92.31%) patients show no stroke (Fig 3). Age wise distribution of stroke shows that stroke was found high in the age group of 56-65 years. The patients who were 55 years old or younger had stroke 4.2%, while no stroke was 95.8%. The age group 56-65 years contained 11.9% stroke and 88.1% shows no stroke. The category of 66-75 years age groups gave 5.1% stroke with 94.9% no stroke and patients having more than 75 years of age have 6.7% stroke while 93.3% have no stroke in patients after coronary artery bypass grafting (Table 1).

Gender wise stroke in patients after coronary artery bypass grafting shows that gender has a minor role over stroke. There is 9.4% stroke in male and 90.6% have shown no stroke. On the other hand, 4.8% of female patients show stroke while 95.2% shows no stroke (Table 2).

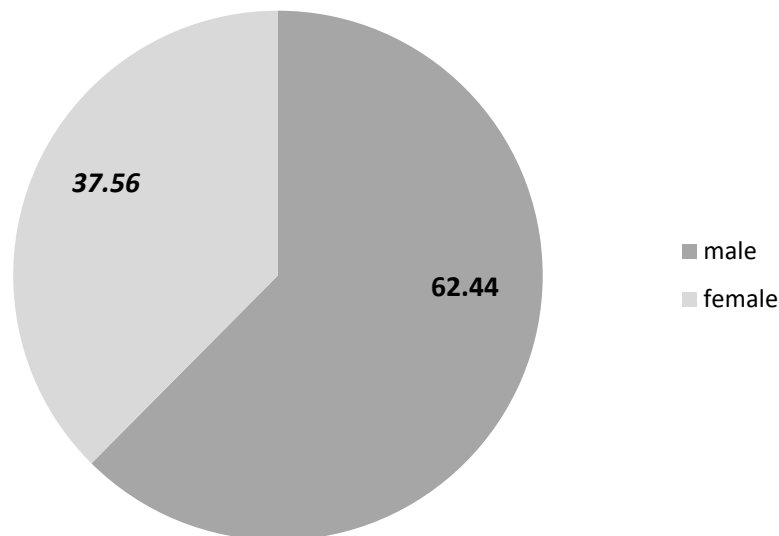


Fig 1. GENDER WISE DISTRIBUTION OF THE PATIENTS

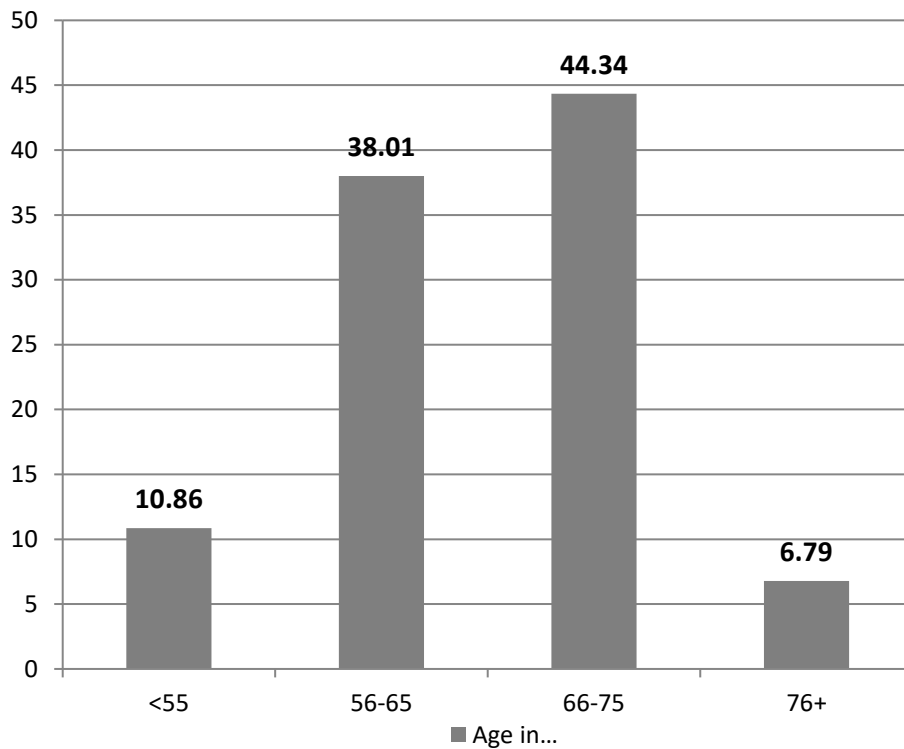


Fig-2: AGE WISE DISTRIBUTION OF THE PATIENTS (average age 64.79 \pm 7.79SD)

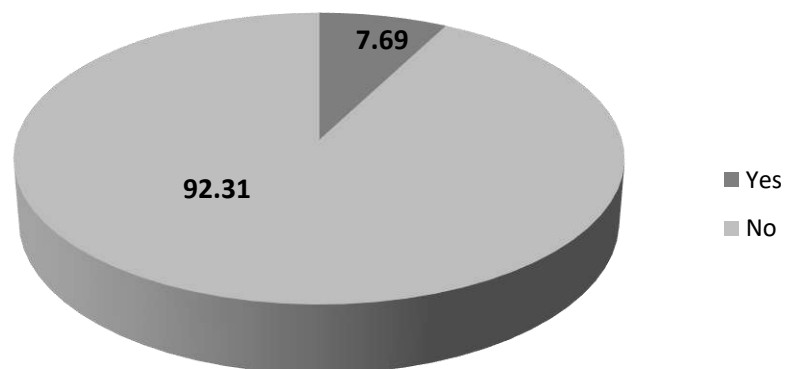


Fig 3: STROKE IN PATIENTS AFTER CORONARY ARTERY BYPASS GRAFTING

Table 1: AGE WISE DISTRIBUTION OF STROKE

	Age Groups (in years)	Stroke		Total	p-value
		Yes	No		
	<= 55.00	1 4.2%	23 95.8%	24 100.0%	0.325
	56.00 - 65.00	10 11.9%	74 88.1%	84 100.0%	
	66.00 - 75.00	5 5.1%	93 94.9%	98 100.0%	
	76.00+	1 6.7%	14 93.3%	15 100.0%	
Total		17 7.7%	204 92.3%	221 100.0%	

Table 2: GENDER WISE DISTRIBUTION OF STROKE

	Gender	Stroke		Total	p-value
		Yes	No		
	Male	13 9.4%	125 90.6%	138 100.0%	0.214
	Female	4 4.8%	79 95.2%	83 100.0%	
Total		17 7.7%	204 92.3%	221 100.0%	

DISCUSSION

It is more common for strokes to occur after coronary grafting⁹. The techniques have improved and cardioplegics, using membrane oxygenation, inline-fibrillation, still there are 1% to 5% of stroke cases reported¹⁰. An estimated 3000-15000 cases every year go through strokes in the recovery post-CABG¹⁰. The post-operative time has not been found associated alone with higher stroke risk¹¹.

Neurological impairment post-op is usually due to the micro-emboli generated during CABG^{11,12}. Moody et al's¹³ examination of the nervous system after a CABG showed many emboli stuck in small brain vessels. Bhasker Rao et al¹⁴ has also reported that brain functions were significantly higher after CABG without a bypass in comparison with a CABG plus and a bypass machine. Earlier studies

have shown association in longer bypass surgery duration and higher frequency of post-operative stroke^{10,11}. Proximal anastomoses with clamping of aorta may also cause an increased chance of stroke in on-pump CABG. Such studies stress that stroke may occur after the CABG.

An early MI that occurred within a day of CABG was linked with 3x greater chances of stroke. Studies by Moe et al¹² reported stroke to occur more frequently after an early MI that is perhaps because of the blood pressure variations and stresses, hyper-coagulability and a greater sympathomimeticism in patients after MI. Diseases like renal failure¹¹, history of CVA⁹ carotid artery disease¹¹ high blood pressure, diabetes-mellitus, old age and poor ejection fraction have been reported to reflect a possible stroke after surgery.

AF is reported to raise the rate of stroke in some settings¹⁵. Low-cardiac-output after the surgery is reportedly linked to a double risk of stroke. Changes in BP, and pro-thrombotic state and poor blood supply to the brain, all play a role in the pathogenesis of stroke. Atrialfibrillation may be relate to the pathogenesis of postoperative but usually not intraoperative ¹² stroke. Post-operative AF along with a poor ejection fraction was associated only with post-CABG stroke; and because stroke during surgery usually occurred before the onset of AF ¹⁴.

In our study, the stroke caused a significant increase in the stay at hospital and cardiac ICU, similar to previous reports ¹⁰. Patients who got a stroke after CABG five times higher in-hospital mortality in comparison to non-stroke patients ¹⁰.

LIMITATIONS OF OUR STUDY

The number of cases in this study setting reflects only on a part of the global image of the situation. An independent neurophysiological evaluation of the cases could predict the post surgical behaviour and incidence of stroke in patients identified as vulnerable.

Postoperative atrial-fibrillation puts the CABG patient at risk of stroke, the fact and its timings were poorly documented in this study. however early-stroke usually occurs after an episode of atrial fibrillation, thus this arrhythmia may not be a good predictor ¹⁰.

CONCLUSION

We found in our study that stroke was more common in patients aged between 55 to 65 years after the coronary artery bypass grafting surgery. Whereas MI is also related to an increased risk of strokes in post CABG Patients.

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