



ERECTILE DYSFUNCTION AS A PROGNOSTIC INDICATOR OF MORTALITY AFTER CORONARY ARTERY BYPASS GRAFTING

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ABSTRACT

OBJECTIVE: To identify the relation of postoperative erectile dysfunction with mortality at 12 months in patients undergoing coronary artery bypass grafting (CABG).

METHODS: This was a prospective observational study conducted at Out Patient Department (OPD) of Cardiovascular Surgery, Punjab Institute of Cardiology Lahore from October 2015 to October 2016. Ninety eight patients were enrolled with exclusion of those with some erectile dysfunction preoperatively, left main stem disease, off pump surgery (OPCAB), emergency CABG, circulatory support with intra-aortic balloon pump before surgery, valvular or congenital defects repair, beta blocker therapy, drug consumption for erectile dysfunction prior to study, hormone replacement therapy, Diabetes mellitus, renal failure, stroke, hepatic impairment and infections. Standard CABG under Cardiopulmonary bypass with Hypothermia was performed in all patients. erectile function of these patients was assessed with the help of International Index of Erectile Function 5 (IIEF-5) questionnaire during first postoperative month.

RESULTS: Out of 98 patients enrolled, 9 patients were lost in follow up and 89 patients participated till the end of study period of 1 year. At twelfth month post operatively IIEF-5 scores improved in 15 patients. Two patients with normal erectile function died and 9 patients with significant erectile dysfunction died at 12 month follow up ($p=0.000$) indicating an association between erectile dysfunction and mortality.

CONCLUSION: Erectile dysfunction after Bypass surgery is related with mortality at 1 year followup.

INTRODUCTION:

Normal sexual functioning plays key role in psycho-emotional function.¹ For those with sexual dysfunction, the quality of life is worsened secondary to the low perception in wellbeing and depressed self-esteem.²⁻⁶ It involves 52% of middle aged and elderly adults in the USA and approximately 322 million men throughout the world.^{3,7} In males with Coronary Artery Disease (CAD) the prevalence of erectile dysfunction (ED) is reported variably between 46% and 75%. Additionally, another study describes problems in achieving erection in 75% of patients while 67% cannot maintain it.^{8,9} Psychogenic, neurogenic, vascular, drug-related, structural, hormonal, pathophysiological mechanisms are believed to cause ED.¹⁰

Coronary artery disease (CAD) is among the most common of cardiac diseases and is the lead-

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ing factor for both morbidity and mortality in whole world.¹¹⁻¹⁵ It is caused by Atherosclerosis which is the factor not only behind CAD but also affects vascular system of whole body.^{3,16-18} Reproductive system is no exception. Moreover, a significant number of patients may not regain normal sexual activity after cardiac event like acute myocardial infarction (AMI), percutaneous coronary interventions (PCI), coronary artery bypass grafting (CABG), or cardiac valve surgery.³⁻⁶

CABG is the most common procedure performed in the field of cardiovascular surgery. However, this procedure is associated with considerable morbidity and mortality.¹⁹ One of the inadvertent result of Cardiopulmonary Bypass (CPB)^{1,9,12,14} erectile dysfunction, may be defined as "the persistent loss of ability to manage penile erection necessary for satisfactory sexual intercourse".²⁰ CPB reduces the capability of endothelium to produce plasma nitric oxide which is a major reason of ED. This leads to augmented risk of postoperative adverse effects.^{2,10,20,21} It can also be the consequence of postoperative beta blockers usage thus augmenting the condition.²² However, all cases should be considered at risk for cardiovascular disease or otherwise, because ED is a vessel related disorder.¹

Only few studies have addressed this phenom-

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anon, probably due to the fact that this is difficult to disclose by patients, considering it sacred, or the researchers have found it difficult to place patients for such a study. Additionally, if a link is established between erectile dysfunction and post CABG mortality, then the erectile function may become a good indicator for mortality among such patients. The aim of the study was to identify "Erectile dysfunction as prognostic indicator for post CABG mortality".

MATERIALS & METHODS:

This Prospective Observational Study, with consecutive sampling was performed at Out Patient Department (OPD) of Cardiovascular Surgery, Punjab Institute of Cardiology Lahore from October 2015 to October 2016. One hundred thirty Seven (137) men aged 45-60 years who underwent CABG at different institutes of cardiovascular surgeries across Punjab, having preoperative three vessel disease, and ejection fraction >30%, LVEDD <55 mm, in NYHA class 1-111, were included. . Patients who already had some erectile dysfunction preoperatively, those who had left main stem disease, who underwent OPCAB, emergency CABG, circulatory support with intra-aortic balloon pump before surgery, valvular or congenital defects repair, those on beta blocker therapy, drug consumption for erectile dysfunction prior to study, patients with hormone replacement therapy, Diabetics, renal failure, Stroke, and hepatic impairment, infections, were excluded from the study. If during the study, the cardiologist believed patient needed the repeat Angiography for revascularization, the patient was excluded from the study.

All patients were given approximately the same balanced anesthesia protocol. The Median sternotomy was performed followed by standard CABG under Cardiopulmonary bypass. Hypothermia was kept between 32-34°C.

Ninety eight patients showed their willingness to be enrolled in study and provided written and informed consent once the aims and objectives of the study were discussed with them. In order to maintain standard questionnaires responses, all patients were counselled to have same female sexual partner for vaginal intercourse only.

After written informed consent patients were counselled and then helped to understand the questionnaire. An international index of erectile function 5 (IIEF-5)²⁴ was used as a questionnaire given to patients at first visit (within 1 month postoperatively) to enroll them and then on successive follow-up visits at 6th and 12th months postop-

eratively. Only 89 patients were turned out and participated till the end of study period of 1 year. A record was also made of Age, Hypertension, Smoking status, preoperative ejection fraction, postoperative ejection fraction, cross clamp time, CPB time, total ICU and Hospital stay, Time on ventilation, NYHA classification (both subjective and objective) and mortality.

Once the questionnaire were submitted by the patients, a categorization was performed. The IIEF-5 score is sum of ordinal responses to 5 items. If the score stood 22-25 the patient was considered having no erectile dysfunction, for a score of 17-21 patient labelled Mild erectile dysfunction, score of 12-16 was categorized as Mild to moderate erectile dysfunction, for 8-11 score a Moderate erectile dysfunction, while for a score between 5-7 patients were labelled as having Severe erectile dysfunction. At twelfth month if the patient had not attended followup clinic he was contacted, to know about the reasons of non-compliance.

All the analysis was performed on SPSS 21, and p value below 0.05 was taken as significant. The Pearson Chi Square test and Spearman Rank Test (as the data is not Continuous) were performed to detect relation of erectile dysfunction with post CABG mortality at 1 year.

RESULTS:

A total of 98 patients were finally enrolled with their consent. Forty three (43.9%) patients were found to have erectile dysfunction at initial postoperative evaluation. Twelve patients recovered at 6th month. From 6th postoperative month, 9 patients left the study, leaving 89 patients for completion of the study.

When erectile dysfunction was assessed at 6th month and compared with findings at 1st postop-

Table 1: Important variables at time of each visit

Variables	At 1 st month		At 6 th month		At 12 th month	
	Normal (n=55)	ED (n=43)	Normal (n=66)	ED (n=32)	Normal (n=68)	ED (n=11)
Hypertension	19	17	22	14	22	9
Smoking	18	5	18	5	19	0
Preop EF <45%	20	17	23	14	27	2
Postop EF <45%	19	17	22	14	26	2
CPB time (>100min)	3	26	11	18	9	11
Cross clamp time (>60min)	7	21	14	14	13	7
Time on mechanical ventilation (>4hours)	23	12	26	9	25	5
ICU Stay>2days	1	2	2	1	2	1
Hospital Stay (>7 days)	20	19	21	18	23	6

Table 2: Erectile dysfunction as per calculation of International Index of Erectile Function 5 (IIEF-5)

Score	A t 1 st Month (n=98)	A t 6 th Months (n=98)	A t 12 th Months (n=89)
Normal (22-25)	55	67 (-3) *	68 (2) [∞]
Mild EF (17-21)	10	7 (-2) *	2
Mild to Moderate (12-16)	13	3 (-1) *	5
Moderate (8-11)	11	11 (-2) *	2 (4) [∞]
Severe (5-7)	9	10 (-1) *	1 (5) [∞]
Mortality	Nil	Nil	11

* Patients lost in follow up, [∞] Patients died.

Table 3: Results of Spearman Rank Test

		Correlations		
			Mortality	IIEF 12th month
Spearman's rho	Mortality	Correlation Coefficient	1.000	-.714**
		Sig. (1-tailed)	.	.000
		N	98	98
	IIEF 12th month	Correlation Coefficient	-.714**	1.000
		Sig. (1-tailed)	.000	.
		N	98	98

** Correlation is significant at the 0.01 level (1-tailed).

erative month, it was observed that those patients with IIEF > 22 have shown no decline in their status of erection at six months. However, data of twelve patients have shown improvement in scores of IIEF-5 whereas, scores in six patients declined.

We compared the score of IIEF-5 at 12th month vs at 1st month. Here scores improved in 15 patients, whereas 20 patients did not return to follow up.

Two patients with normal erectile function died and 9 patients with significant erectile dysfunction died at 12 month follow up ($p=0.000$) (Table-2). When the data was analyzed with Spearman Rank Test, investigating whether there is any association / correlation between erectile dysfunction and mortality, the results were as shown in Table 3. This analysis shows that there is an association between erectile dysfunction and mortality.

DISCUSSION:

Whether or not the dysfunction in penile erection is an established complication after coronary artery bypass grafting, is a debatable issue. The incidence after CABG is studied in various studies, comparing off pump vs on pump grafting techniques. Few medications like beta blockers are also possible culprits. However what is least known is whether it has any relation with post-operative mortality or otherwise.

Some researchers are of the view that on-pump (CPB) CABG may have some established bad effects on endothelial functions. CPB reduces the

ability of endothelial cells to build and release nitric oxide (NO). This in turn may lead to the increased risk of the postoperative complications.¹⁷⁻¹⁸

Other investigators disagree, however. They consider that this method has excellent results without impairment in the neurocognitive outcome and quality of life and even CABG with this technique can improve sexual function.^{16,18,19} According to them CABG has shown improvement in erectile dysfunction, especially when it is severe.

Results of off-pump CABG vs on-pump CABG were assessed and analyzed in various studies under variety of titles. The findings were insignificantly different however, with similar states of neurocognitive dysfunction, quality of life, cardiac outcomes, survival, regardless of gender.^{3,15,16,17} On erectile dysfunction, however, there are only few published studies observed in medical literature. In recent past, Mohamed et al.²⁴ studied effects of CABG with or without CPB, on sexual functions via IIEF-5 score and penile duplex ultrasonography findings. They suggested significantly higher improvements in post CABG IIEF-5 score in patients undergoing off-pump surgeries. However, duplex ultrasound data failed to demonstrate any significant difference. They concluded that type of surgery significantly influences sexual function after CABG.

In our study, all patients underwent on-pump CABG. We have found no significant relation between CPB & Cross Clamp times with scores of IIEF-5 at 12th month follow up ($p=0.308$ and $p=0.642$ respectively). However significant association ($p=0.000$) was found between prolong CPB time and mortality at 12th month post CABG followup. Surprisingly cross clamp time was not associated with mortality at similar time frame ($p=0.104$).

Heaton et al.²⁵ suggested that because of the circuit device usage, on-pump CABG may play quite a significant impact on erectile function. Additionally, Gueglio et al.²⁶ believed that the preoperative condition is the most important predictive factor for erectile function post-CABG. Another study by Hizli et al.²⁷ showed similar results. Plasma NO levels after on- or off-pump CABG were studied by Canguven et al.²⁸, demonstrating no significant difference in the early postoperative period. Beghetti et al.²¹ were of the opinion that adverse events with cardiopulmonary bypass may lead to dysfunctional endothelium secondary to production and release of NO in plasma, which has an increased risk of erectile dysfunction.

In our study, all patients were operated with



the use of CPB, that's why we analysed all of our patients as a total, so, the decrease in IIEF-5 score could be attributed to the use of CPB, consistent with the literature.

No robust study has yet been performed to find out any association between erectile dysfunction and post CABG mortality, whereas a lot has been done in the field of cardiology where significant relation has been established between ischemic heart disease and erectile dysfunction. Though our study is unique that it has shown some relation between erectile dysfunction and post-CABG mortality, still it demands a robust randomized study to prove erectile dysfunction as prognostic indica-

tor of mortality for patients who undergo coronary artery bypass grafting.

Our study has multiple known limitations. The period of follow up needs to be longer for better results. However the patient dropout rate was significant both at start and during the study period. We did not consider to analyse the reasons why patients did not complete the questionnaires was another limitation. Thus study included small sample size. The data on rehabilitation was missing. Preoperative IIEF-5 scores may have been taken for better analysis. Although the results show strong relation between mortality and erectile dysfunction, yet it has to be validated in further larger studies.

Author's Contribution

SA: Collected the data and conducted the study.
WR: Helped in conducting the study. MSN: Helped in data analysis. MI: Tables and Figures.

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