Outcome of Patients Who Underwent Coronary Artery Bypass Graft With Concomitant Valve Surgery in Philippine Heart Center

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Background --- The Philippine Heart Center (PHC) is the center of cardiovascular care in the country, catering to patients from all walks of life. The annual statistics of patients undergoing coronary artery bypass graft (CABG) surgery is 500 to 600 and there has been a comparable mortality rate in our institution with the foreign data, 3.69% vs. 2.5%, respectively. However, mortality rate significantly increases when CABG is done with concomitant valve surgery and/or in the presence of other identified risk factors. This study was conducted to present the institution's experience regarding coronary artery bypass graft surgery with concomitant valve surgery.

Methods --- Surgery department census from January 1, 2005 to December 31, 2006 was reviewed for all the cases of CABG with concomitant valve surgery. The data collection was complemented by accessing the hospital's electronic medical records (EMR). Variables identified as risk factors by Fortinez JT and Edwards et al. in their CABG with valve surgery model, and in PHC Risk Index and American College of Cardiology/American Heart Association (ACC/AHA) Practice Guidelines for CABG surgery were extracted and combined.

Results --- Total incidence of outcomes was measured and reoperation for bleeding was the most frequent complication followed by renal failure, cerebrovascular disease, deep sternal infection, and lastly reoperation for post-pericardiotomy syndrome. The mortality rate was 14.6%. We also measured outcomes against specific concomitant valve surgeries and yielded multiple valve surgery as the one with the highest mortality rate of 28.57%, followed by mitral valve and aortic valve surgeries. Concomitant multiple valve surgery also had the highest incidence of complications such as reoperation for bleeding, renal failure and deep sternal infection. Concomitant mitral valve surgery, however, had the highest incidence for postoperative cerebrovascular disease and had the longest total and postoperative length of hospital stay

Conclusion --- The results of this study, having a small population size, could not in any way be compared with the results observed internationally. However, this study gave us some insights on the characteristics, complications and mortality of this subset of patients being operated on in our own institution. This may somehow pave the way to large scale studies in our country, involving multiple centers who handle this subset of patients. ***Phil Heart Center J 2007; 13(2):119-123.***

Key Words: Coronary artery bypass graft surgery ■ valve surgery ■ mortality, complications ■cerebrovascular disease

The Philippine Heart Center (PHC) is the center of cardiovascular care in the country cater ing to patients from all walks of life. A large volume of patients is being admitted in this hospital, either due to medical management or procedural intervention. The annual statistics of patients undergoing coronary artery bypass graft (CABG) surgery is 500 to 600 and there has been a comparable mortality rate in our institution with the foreign data, 3.69% vs. 2.5%, respectively.[1,13] However, mortality rate significantly increases when CABG is done with concomitant valve surgery and/or in the presence of other identified risk factors.[1-4]

The PHC CABG registry aims to provide us significant information on the quality of care, procedural outcome and other possible risk factors innate in our own set of patients. Risk stratification models of patients who underwent CABG and valve surgeries had been made in the past both internationally and locally,[1-11] but the information on the subgroup of patients who underwent CABG with valve surgery in our institution has been minimal and not really been put into focus. This study was conducted to determine the outcomes, such as in-hospital mortality and morbidities, of patients who underwent CABG with concomitant valve surgery.

Methods

Surgery department census from January 1, 2005 to December 31, 2006 was reviewed for all the cases of CABG with concomitant valve surgery. The data collection was complemented by accessing the hospital's electronic medical records (EMR). Variables identified as risk factors by Fortinez JT and Edwards et al. in their

Accepted paper for PHC 15th Annual research Paper Competition 2007 and for 38th PHA Annual Convention held on May 16-18, 2007 at Edsa Shangrila Hotel, Philippines

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CABG with valve surgery model, and in PHC Risk Index and American College of Cardiology/American Heart Association (ACC/AHA) Practice Guidelines for CABG surgery were extracted and combined.[1,3-5,9,13] These are pulmonary artery systolic pressure (PASP), bypass time (BT), ischemic time (IT), previous cardiac operation, serum creatinine of >2 mg%, operative status whether emergency, urgent or elective, age, diabetes mellitus (DM), gender, dialysis-dependent renal failure (DDRF), three-vessel CAD (3VD), preoperative intra-aortic balloon pump (IABP) or inotropes, NYHA class IV, body surface area (BSA), left ventricular ejection fraction (EF), myocardial infarction (MI), hypertension (HPN) and case category. Other risk factors identified by Edwards et al.[9] such as chronic lung and peripheral vascular diseases were not included since they were consistently found to be insignificantly correlated with mortality in previous local studies.[1,5,7] Immunosuppressive therapy which was also identified as one of the risk factors by Edwards et al.[9] was not included since the details of this variable's inclusion was not clear to the author. Outcomes such as mortality, complications and length of hospitalization were obtained from the medical records. Mortality is defined as death occurring at anytime during the same hospitalization. Complications such as cerebrovascular disease (CVD) is either infarct or bleed, while deep sternal infection (DSI) is surgical site infection of the anterior chest post-open heart surgery, necessitating debridement. Renal failure is the need for any form of dialysis post-operatively or as defined in RIFLE classification.[12] Valve surgery is either replacement or repair of native or prosthetic valve. Multiple valve surgery (MLVS) is surgery involving any combination of valves.

Statistical Analysis

Frequency and percentage were used to characterize the categorical variables, while mean and standard deviation were used to present continuous variables. The data gathered were analyzed using Chi square. The small population size was addressed by using Fisher's Exact Probability Test for significance and finally determined by t-test.

Results

Fifty-three patients were identified and out of which only 41 (77%) medical charts were available for review. Of the 41 medical charts retrieved, 1 had missing data on BT, IT and echocardiographic report while 2 more charts had no echocardiographic data.

Table 1 illustrates the clinico-demographic characteristics of the included patients. The mean age of patients does 58.9 years, with males comprise majority of the population. Mitral valve surgery was the most common concomitant valve surgery and almost half of the population had 3-vessel disease and hypertension. Neither any body was operated on an emergency basis nor was there a patient in dialysis-dependent renal failure. A small number of patients came in with diabetes, moderately severe pulmonary arterial systolic pressure, an ejection action of less than 40%, in severe heart failure and with a history of myocardial infarction within seven days. Majority were private cases. Likewise, majority had prolonged bypass and cross-clamp time.

Table 2 shows the outcomes of the patients who underwent CABG with concomitant valve surgery. Reoperation for bleeding was the most frequent complication, followed by renal failure, cerebrovascular disease, deep sternal infection, and lastly reoperation for post-pericardiotomy syndrome. The in-hospital mortality rate was 15%.

Table 1. Clinico-Demographic Characteristics of the patients included

Characteristic	Frequency*	%
Age in years		
Mean (SD)	58.9 (9.5)	
Gender		
M	28	68
F	13	32
Concomitant Valve Surgery		
Aortic	11	27
Mitral	23	56
Multiple	7	17
DM	6	15
HPN	20	49
Previous Cardiac Operation	2	5
3 Vessel Disease	18	44
Serum Creatinine >2mg%	2	5
Operative Status		
Emergency	0	0
Urgent	14	34
Elective	27	66
Preoperative IABP/Inotropes	11	27
NYHA class IV	1	2
PASP ≥60 mmHg (n=38)	7	18
Myocardial Infarction within		
24 hrs	0	0
7 days	3	7
>7 days or no MI	38	93
EF (n= 38)		
≥40%	34	89
<40%	4	11
BT (n= 40)		
>180 mins	26	65
≤180 mins	14	35
IT (n= 40)		
>120 mins	32	80
60-120 mins	7	18
<60 mins	1	2
Case category:		
Private	36	88
Service	5	12

*n=41, unless otherwise specified

Among the risk factors identified, it was only the gender difference which showed statistically significant relationship with the outcome in this study, with the female being at risk of developing postoperative acute renal failure (p=0.028). A number of variables however, showed trends of association with the outcome. Concomitant valve surgery and ischemic time were not statistically measured since the small number of population did not allow analysis. Tables 3.1 and 3.2 show all the risk factors as measured against the outcomes.

We also measured outcomes against specific concomitant valve surgeries. Multiple valve surgery yielded the highest mortality rate of 29%, followed by mitral valve and aortic valve surgeries. Concomitant multiple valve surgery also had the highest incidence of complications such as reoperation for bleeding, renal failure and deep sternal infection. Concomitant mitral valve surgery however, had the highest incidence for postoperative cerebrovascular disease and had the longest total and postoperative length of hospital stay (Table 4).

Table 2. Incidence of outcomes observed among patients who underwent CABG with concomitant valve surgery

Outcome	Frequency	%
Death	6	15
CVD	4	10
Reoperation for PPS	1	2
Reoperation for Bleeding	7	17
Renal Failure	5	12
Deep Sternal Infection	2	5

Table 3.1. Association of Risk Factors to Outcomes of Mortality, CVD and Renal Failure

Risk Factors		Mortality					CVD					Renal Failure				
		Survived N=35		Died N=6		*p*	No N=37		Yes N=4		*p*	No N=36		Yes N=5		*p*
Age (mean, SD)		58.2 (8.7)		63 (13.5)			58.4(9.4)		63.8(12.4)			58.2(9.5)		63.8 (12.4)		
		n	**%**	**n**	**%**		**n**	**%**	**n**	**%**		**n**	**%**	**n**	**%**	
Gender	M	26	93	2	7	0.07	26	93	2	7	0.58	27	96	1	4	***0.03***
	F	9	69	4	31		11	85	2	15		9	69	4	31	
DM	+	29	83	6	17	0.57	32	91	3	9	0.48	30	86	5	14	1.0
	-	6	100	0	0		5	83	1	17		6	100	0	0	
HPN	+	17	81	4	19	0.66	20	95	1	5	0.34	17	81	4	19	0.66
	-	18	90	2	10		17	85	3	15		19	95	1	5	
BSA	≥1.4	31	84	6	16	1.0	34	92	3	8	0.35	32	86	5	14	0.58
	<1.4	4	100	0	0		3	75	1	25		4	100	0	0	
Previous Cardiac Surgery	+	2	100	0	0	1.0	2	100	0	0	1.0	2	100	0	0	1.0
	-	33	85	6	15		35	90	4	10		34	87	5	13	
3 vessel disease	+	14	78	4	22	0.38	16	89	2	11	1.0	15	83	3	17	0.64
	-	21	91	2	9		21	91	2	9		21	91	2	9	
Serum Creatinine > 2mg%	+	2	100	0	0	1.0	1	50	1	50	0.19	1	50	1	50	0.19
	-	33	85	6	15		36	92	3	8		35	90	4	10	
Operative Status	Elective	23	85	4	15	1.0	24	89	3	11	1.0	23	85	4	15	0.65
	Urgent	12	86	2	14		13	93	1	7		13	93	1	7	
Pre-op IABP/ Inotropes	+	10	91	1	9	1.0	19	91	1	9	1.0	10	91	1	9	1.0
	-	25	83	5	17		27	90	3	10		26	87	4	13	
NYHA Class IV	+	1	100	0	0	1.0	1	100	0	0	1.0	1	100	0	0	1.0
	-	34	85	6	15		36	90	4	10		35	88	5	12	
PA SP ≥ 60 mmHg (n=38)	+	5	71	2	29	0.30	6	86	1	14	1.0	6	86	1	14	1.0
	-	27	87	4	13		28	90	3	10		27	87	4	13	
MI within 7 days	+	3	100	0	0	1.0	2	67	1	33	0.27	3	100	0	0	1.0
	-	32	84	6	16		35	92	3	8		33	87	5	13	
EF (n=38)	*<40%*	4	100	0	0	1.0	4	100	0	0	1.0	4	100	0	0	1.0
	≥40%	28	82	6	18		30	88	4	12		29	85	5	15	
Bleeding Time	*>180 min*	23	88	3	12	0.65	24	92	2	8	0.60	24	92	2	8	0.32
	≤ 180 min	11	79	3	21		12	86	2	14		11	79	3	21	
Case Category	PVT	30	83	6	17	1.0	32	89	4	11	1.0	31	86	5	14	1.0
	SVC	5	100	0	0		5	100	0	0		5	100	0	0	

Table 3.1. Association of Risk Factors to Outcomes of Reoperation and Deep Sternal Infection

Risk Factors	Reoperation for PPS					Reoperation for Bleeding					Deep Sternal Infection				
	No N=40		Yes N=1		p	No N=34		Yes N=7		p	No N=39		Yes N=2		p
Age (mean, SD)	--		-		-	59.1 (9.5)		58.1 (10.2)		0.82	--		--		-
	n	%	n	%		n	%	n	%		n	%	n	%	
Gender															
M	27	96%	1	4%	1.0	22	79%	6	21%	0.40	27	96%	1	4%	0.54
F	13	100%	0	0%		12	92%	1	8%		12	92%	1	8%	
DM															
without	34	97%	1	3%	1.0	29	83%	6	17%	1.0	33	94%	2	6%	1.0
with	6	100%	0	0%		5	83%	1	17%		6	100%	0	0%	
HPN															
without	20	95%	1	5%	1.0	16	76%	5	24%	0.41	20	95%	1	5%	1.0
with	20	100%	0	0%		18	90%	2	10%		19	95%	1	5%	
BSA															
≥1.4	36	97%	1	3%	1.0	30	81%	7	19%	1.0	35	95%	2	5%	1.0
<1.4	4	100%	0	0%		4	100%	0	0%		4	100%	0	0%	
Previous Cardiac Surgery															
without	38	97%	6	3%	1.0	33	85%	6	15%	0.31	37	95%	2	5%	1.0
with	2	100%	0	0%		1	50%	1	50%		2	100%	0	0%	
3VD															
without	23	100%	0	0%	0.43	18	78%	5	22%	0.43	22	96%	1	4%	1.0
with	17	94%	1	6%		16	89%	2	11%		17	95%	1	5%	
Serum Crea >2mg%															
without	38	97%	1	3%	1.0	32	82%	7	18%	1.0	37	95%	2	5%	1.0
with	2	100%	0	0%		2	100%	0	0%		2	100%	0	0%	
Operative Status															
Urgent	13	93%	1	7%	0.34	13	93%	1	7%	0.38	14	100%	0	0%	0.54
Elective	27	100%	0	0%		21	78%	6	22%		25	93%	2	7%	
Pre-op IABP/Inotropes															
without	29	97%	1	3%	1.0	27	90%	3	10%	0.06	29	97%	1	3%	0.47
with	11	100%	0	0%		7	64%	4	36%		10	91%	1	9%	
NYHA class IV															
no	39	98%	1	2%	1.0	34	85%	6	15%	0.17	38	95%	2	5%	1.0
yes	1	100%	0	0%		0	0%	1	100%		1	100%	0	0%	
PASP ≥60 mmHg (n=38)															
no	30	97%	1	3%	1.0	25	81%	6	19%	1.0	29	94%	2	6%	1.0
yes	7	100%	0	0%		6	86%	1	14%		7	100%	0	0%	
MI															1.0
within 7 days	2	67%	1	33%	0.07	3	100%	0	0%	1.0	3	100%	0	0%	
>7 days or no MI	38	100%	0	0%		31	82%	7	18%		36	95%	2	5%	
EF (n= 38)															
≥40%	33	97%	1	3%	1.0	29	85%	5	15%	0.14	33	97%	1	3%	0.20
<40%	4	100%	0	0%		2	50%	2	50%		3	75%	1	25%	
BT (n= 40)															
>180 mins	26	100%	0	0%	0.35	22	85%	4	15%	0.67	24	92%	2	8%	0.53
≤180 mins	13	93%	1	7%		11	79%	3	21%		14	100%	0	0%	
Case category:															
Private	36	100%	0	0%	0.12	30	83%	6	17%	1.0	34	94%	2	6%	1.0
Service	4	80%	0	20%		4	80%	1	20%		5	100%	0	0%	

Table 4. Frequency of Outcome According to Concomitant Valve Surgery

Outcome	Aortic Valve Surgery N=11	Mitral Valve Surgery N=23	Multiple Valve Surgery N=7
Mortality (n,%)	1 (9)	3 (13)	2 (29)
CVD (n,%)	1 (9)	3 (13)	0
Reoperation for PPS (n,%)	0	1 (2)	0
Reoperation for Bleeding (n,%)	0	4 (17)	3 (43)
Renal failure (n,%)	1 (9)	2 (9)	2 (29)
Deep Sternal Infection (n,%)	1 (9)	0	0
Length of Hospital Stay (LOHS), days (mean ± SD)	20±8	27.7±20.1	20.4±12.5
Post-operative LOHS, days (mean ± SD)	13.4±7.6	18.6±13.1	15.6±.5

Discussion

This is the first study in our institution that focused on the subset of patients who had coronary artery bypass graft with concomitant valve surgery. Internationally, the study done by Edwards et al.[9] was somehow similar but it only included patients with concomitant valve repair and also did not take into consideration those patients who had concomitant multiple valve surgery. The statistically calculated non-significance of the variables in this study may be attributed to a small sample size and could be strengthened by increasing the population. Nonetheless, being a female still significantly exemplified the risk for complication. The mortality rate that we have observed here almost doubled what was observed in the study of Fortinez JT on valve surgeries and almost four time that of Milo et al.'s study on CABG surgery.1,5 This suggests that the combined operative risks of these patients significantly increase mortality and complications than patients who undergo any individual CABG or valve surgeries combined. But again, this has to be proven statistically.

Conclusion

The results of this study, having a small population size, could not in anyway be compared with the results observed internationally.[8-10] However, this study may give us some insight on the characteristics, complications and mortality of this subset of patients being operated on in our own institution and may somehow pave the way to a large scale studies here in our country. It is therefore recommended that a larger population be studied to verify and somehow confirm what have already been at hand.

References

1. Milo JC, Vilela GC. Estimating the risk of in-hospital mortality after CABG surgery at the Philippine Heart Center: A comparison of two prediction models. *PHC J 2004;11:6-12.*
2. Ferguson BT, Jr. et al. A decade of change- Risk profiles and outcomes for isolated Coronary Artery Bypass Grafting procedures, 1990-1999: A report from the STS National Database Committee and the Duke Clinical Research Institute. *Ann Thorac Surg 2002;73:480-90*
3. Vilela GC, Go LRT, Cruz MBO. Validation of risk index for in-hospital mortality after Coronary Artery Bypass Graft Surgery at the Philippine Heart Center. *PHC J 2000;7:3-10*
4. Go LR, et al. Risk Index and Predictor of In-Hospital Mortality after CABG. A Five-year retrospective Study Conducted at Philippine Heart Center. *PHC J 1998;(5):2-11*
5. Fortinez JT. Cardiac Valve Surgery at Philippine Heart Center: Determinants of In-Hospital Mortality. *Philippine Heart Center-DETR PHC.R.011.04*
6. Villanueva JG, et al. Validation of risk index scoring for in-hospital mortality following cardiac valve surgery. *Philippine Heart Center - DETR CRF.R.023.01*
7. Umbalin SD, et al. Bedside estimation of risk as an aid for decision making in valve surgery. *Philippine Heart Center DETR CRF.R.052.00*
8. Ambler G, et al. Generic, Simple Risk Stratification Model for Heart Valve Surgery. *Circulation 2005;112:224-231*
9. Edwards FH, et al. Prediction of Operative Mortality after Valve Replacement Surgery. *JACC 2001;37(3):885-92*
10. Jamieson WR et al. Risk stratification for Cardiac Valve replacement. National cardiac surgery database. *Ann Thorac Surg 1999;67:943-51*
11. Shroyer LW et al. The 1996 Coronary Artery Bypass Risk Model: The Society of Thoracic Surgeons Adult Cardiac National Database. *Ann Thorac Surg 1999;67:1205-8*
12. Van Biesen W et al. Defining Acute Renal Failure: RIFLE and Beyond. *Clin J Am Soc Nephrol 2006;1:1314-1319*
13. Eagle KA, Guyton RA et al. ACC/AHA 2004 Guideline Update for CABG Surgery: A Report of the ACC/AHA Task Force on Practice Guideline. *JACC September 2004:e213-e311*