Early Outcome of Bifurcational Coronary Artery Stenting

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Abstract

BACKGROUND : Bifurcational coronary lesions are frequent and amounts to almost one fifth of routine practice concerning up to 15 – 20 % of cases . Revascularization by percutaneous coronary intervention (PCI), of bifurcational lesion has become easier by stenting yet it remains a frequent challenge.

OBJECTIVE : To evaluate the success and hospital complications of two most frequent technique of stent deployment in bifurcational PCI.

METHODS : We prospectively analysed the data of 140 consecutive patients with bifurcational PCI at Ibn_Al-Bitar Hospital for cardiac surgery for the period from July 2008 to July 2009 .

Depending on whether the side branch was stented or not, the patient has fallen into two groups : -

Group A; stenting of the main vessel and angioplasty of the branch.

Group B; stenting of both main vessel and its branch .

The early outcome of the bifurcational PCI and all complications during hospitalization that include; death, acute Myocardial infarction , emergency percutaneous treatment and coronary artery bypass graft (CABG) were evaluated in the studied groups.

RESULTS : The studied sample consisted of 140 patients,107(76.3%)were male and 33(23.7%) were female. Group A consisted of 90 patients (64.3%) while group B consisted of 50 patients(35.7%).Acute procedural success was (94.2%) in group A and (80%) in group B while hospital major adverse cardiac event(MACE) were noted in 3.8% of group A and 20% of group B,(PV=0.04)

CONCLUSION: In bifurcational PCI stenting of the side branch has made no extra advantage in term of procedural success and early outcome.

KEY WORDS **:** Percutaneous coronary intervention, bifurcational coronary stenting.

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Introduction :

In general the term coronary artery bifurcation is use when; coronary artery divides into equally important branches or a main branch gives a way side branch, which is large enough to be haemodynamically significant. In routine practice coronary lesions involving bifurcation are not rare concerning up to 15 -20 % of total coronary artery lesions. In percautaneous coronary intervention, the treatment of bifurcational lesion is a challenge to the interventional cardiologist.[(1)(2)]

Methods:

A prospective study was conducted at Ibn-AL-Bitar Hospital for Cardiac Surgery from July 2008 to July 2009, which include a total of 140 patients with significant bifurcational coronary artery lesion, and according to coronary artery stenting techniques the studied sample was divided into two group;

-Group (A): stenting the main vessel and balloon angioplasty of the side branch.

-Group (B) : stenting both the main vessel and side branch.

In general, both branches were stented when ; the reference vessel size of the side branch was greater than 2.5 mm, significant ostial involvement, supplying large myocardial area and dissection of side branch. Prior to the interventional procedure each patient received oral aspirin 100 mg/day and clopidogrel 150 mg/day for at least 3 days before the procedure and intravenous bolus dose of heparin 70 u /kg was given during the procedure. Serum creatinine kinase was measured post-operative for each patient who had; transient or permanent vessel occlusion during the procedure, prolonged chest pain after the procedure, ECG changes and for patient with unsuccessful procedure.

Angiographic success was defined as the a achievement of residual stenosis < 50% with at least TIMI3 flow in both the parent vessel and side branch[(3).] Procedural success was define as the achievement of angiographic improvement in the absence of any in-hospital Major Adverse Cardiac Event (MACE) which include death, myocardial infarction or emergency percutaneous treatment or coronary artery bypass graft (CABG).The early out of bifurcational PCI and all complications during hospitalization were evaluated in the studied groups

Statistical Analysis :

All variable were measuread by using number (No.), percentage (%) and mean±SD. A (P) value (<0.05%)was considered statistically significant.

Result:

In this a prospective study of 140 patients (76.3 %) were males and (23.7%) were females and male to female ratio was (3.25 : 1), with significant coronary

artery lesion. The studied sample as shown in table (1) was classified according to coronary artery stenting technique in tow group:

-Group (A) ; 90 patients (64.3 %) underwent stenting in main vessel and balloon dilatation of side branch.

-Group (B) ; 50 patients (35.7 %) underwent stenting of both main and side branch.

Table (2) showed there was no significant difference between group (A) and (B) in regarding to the clinical characteristics; (hypertension, hypercholesterolemia, diabetes mellitus, smoking and positive family history of ischemic heart disease). The analysis of studied groups according to the extent of coronary artery disease reveals that; single vessel disease was more frequent in group (A) which represent (53.8 %) while double vessels disease was more frequent in group (B) which represent (64 %) and the difference statistically significant as shown in **Table (3).**

Comparison of studied groups according to location of bifurcational lesion reveals that; bifurcational lesion between left anterior descending artery (LAD)and septal branch was more frequent among group (B),which represent (12.5%) and the statistical difference was significant (P V =0.04) as shown in **Table (4).**

In comparison of percutaneous coronary revascularization procedure between the studied groups; there was significant difference in each of the following characteristics ; total stent length(group A 21±13 mm/patient versus group B 35±80 mm/patient, PV=0.000001), number of stent per patient (group A 1.3±0.6 versus 2.5±0.4,PV=0.00001) and procedural time(group A 87±33 minute versus group B 113±49 minute , PV=0.00001) while there was no significant difference between studied groups in each of the following variables; maximal inflation pressure and simultaneous kissing balloon inflation as shown in **Table (5).**

The analysis of immediate post procedure outcome according to the studied groups reveals that; there was significant difference in hospital MACE (Major Adverse Cardiac Event)which represent (3.8 %) and (20%) in group (A) and (B) respectively as shown in table (5).

Table (1) : Demographic Data

	Group A No.(%)	Group B No.(%)	Total
Male	**75(83.33%)**	**32(64%)**	**107(76.28%)**
Female	**15(16.67%)**	**18(36%)**	**33(23.72%)**
Total	**90 (100%)**	**50(100%)**	**140(100%)**
Mean age	**60±10**	**55±12**	

Table (2) : Distribution of studied groups according to clinical characters

Risk factors	Group A No.(%)	Group B No.(%)	P value
Hypertension	**54(59.6%)**	**25(50%)**	**0.58**
Hypercholesterolemia	**14(15.3%)**	**12(24%)**	**0.09**
Smoking	**48(53.8)**	**18(36%)**	**0.10**
Diabetes Mellitus	**19(21.1%)**	**12(24%)**	**0.62**
Positive Family History	**7(7.6%)**	**6(12%)**	**0.09**

Table (3) : Analysis of studied groups according to extent of coronary Artery disease.

Extent of Coronary Artery Disease	Group A No.(%)	Group B No.(%)	P Value
Single vessel Disease	48(53.8%)	12(24%)	0.0007
Double vessels disease	24(26.9%)	32(64%)	0.00001
Three vessels disease	18(19.2%)	6(12%)	0.22
Total	90(100%)	50(100%)	

Table(4) : Distribution of studied groups according to location of bifurcational lesion

Location of bifurcational lesion	Group A No.(%)	Group B No.(%)	P value
LAD / Diagonal	67(75%)	26(52%)	0.73
LCX / OMs	15(17.3%)	18(36%)	0.09
RCA / PDA	5(5.8%)	0(0%)	0.06
LAD / septal	3(1.9%)	6(12 %)	0.04
Total	90(100%)	50(100%)	

LAD : Left Anterior Descending artery
LCX : Left Circumflex, OMs : Obtuse Marginal
RCA : Right Coronary Artery, PDA : Posterior Descending Artery

Table (5) : Analysis of percutaneous coronary revascularization procedural characteristics according to studied groups.

		Group A	Group B	P value
Total stent length (mm)/patient		21±13	35±80	0.000001
No. of stents / patient		1.3±0.6	2.5±0.4	0.000001
maximal inflation pressure (atm)	main vessel	12.2±4.3	14.3±3.2	0.57
	side Branch	8.5±2.5	9.1±2.9	0.43
Simultaneous Kissing Balloon inflation (%)		61(67.3%)	22(87.5)	0.60
Procedural Time (min.)		87±33	113±49	0.00001

Table(6) : Immediate post-procedural outcome according to studied groups

		Group A No.(%)	Group B No.(%)	P value
Procedural success		85 (94.2%)	40(80%)	0.7
In hospital MACE*		4(3.8%)	10(20%)	0.04
	Death	0	0	
	Myocardial Infraction(MI)	4	10	
	CABG	0	0	

** MACE : (death , MI and CABG)*

Discussion

Until the current era, percutaneous coronary intervention (PCI) of bifurcational lesion has remained technically challenging [3]. Immediate and mid-term results using balloon angioplasty were disapponinting despit technical refinements including kissing balloon inflations. The development of low – profile angioplasty balloons and new generation stents as well as the efficacy of thienopyridine-asprin association have progressively modified our routine practice of coronary stenting which has become a routine practice with highly predictable results in the majority of cases[4].

Current study reveals that; the extent of coronary artery disease(double vessel disease versus single vessel disease) , the total sent length and number of stents per patient was more in group (B) than group (A) and this results could explain the significant high frequency rate of early PCI complications (MACE) among group (B) and this finding in agreement with Bauters C, Hubert et al [5],[6] .

The success rate of stenting both main and side branch (group B) was 87% and this finding was not in agreement with that of Tominaga R, et al who reported that the success rate of stenting both branch approximately 50% [7][8],and this great difference of success rate between our study and Tominaga R et al study may be explained by the fact that; we were stenting both main and side branch in patient who did not have extensively calcified and fibrotic bifurcational lesion which necessitate the use of debulking technique(directional and rotational atherectomy) which is not in routine use in our practice. Howevere Lefevre Thiery et al has reported that angiographic result as well as immediate of outcome of bifurcation lesion were not improved by debulking techniques [3][9].

Regarding to immediate post procedural outcome our study reveals that ;in hospital MACE occurred more frequently with two stents group (20% in group B versus 3.8% in group A), this finding was comparable with that of Lefevre Thiery et al[3].There has been numerous report confirming that ; the systematic use of two stents for treatment of two branches of bifurcation lesion was associated with poor outcome compared to one stent [10].[11] [12].

Conclusion

For the treatment of true bifurcational lesion, a complex strategy of stenting both vessels provided no advantage in terms of procedural success and early outcome versus simpler strategy of stenting only the main vessel. Taking wise decision about stenting the side branch need more considerable criteria.

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