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PERCUTANEOUS INTERVENTION FOR CORONARY BIFURCATIONS-OUR EXPERIENCE ON 133 PATIENTS AT ARMY CARDIAC CENTRE LAHORE

Afsar Raza[1], Saad Sultan Ghumman[2], Muhammad Luqman[3], Tariq Hassan[4], Naseer Samore[5], Samina Parveen[6], Yasmin Rafique[7]

[1] Army Cardiac Centre, Lahore - Pakistan

[2] Shifa College of Medicine, Islamabad - Pakistan

[3-7] Department of Cardiology, CMH, Lahore - Pakistan

Address for Correspondence:
Dr. Afsar Raza,
Cardiologist,
Army Cardiac Centre, Lahore - Pakistan

E-mail: afsarraza@hotmail.com

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All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: To study the safety and efficacy (pre and post procedure outcomes) of stenting the main vessel (MV) with or without stenting the side branch (SB) in the treatment of coronary bifurcation lesions.

Methodology: In this retrospective analysis of 133 patients, operated between Oct 2009 and Sept 2010, true coronary bifurcation lesions using the registry at Army Cardiac Centre were analyzed. All angiograms and case notes were reviewed for sites of lesions, MADINA classification, angle of bifurcation, size of MV and of SB, number and type of stents used, total procedure and radiation time, and patient characteristics. In-hospital MACE events were recorded for all patients.

Results: Of the 133 cases, 120 (90.2 %) underwent MV stenting alone, while 13(9.8%) underwent SB stenting as well. Drug Eluting Stent (DES) with mini-crush technique was deployed in the majority of the latter cases. In hospital clinical follow up showed 2 NSTEMI in the SB stents ($p=0.009$) whereas no MACE event was recorded for MV stents alone.

Conclusion: Stenting of only MV is safer, effective and economical than stenting of both MV and SB. Moreover contrast related risks and risks of radiation are much less with stenting the MV in the treatment of coronary bifurcation as compared to stenting of both MV and SB.

Key Words: Percutaneous Intervention, Bifurcation Lesion, MACE

INTRODUCTION

Since the advent of modern interventional cardiology, management of bifurcation lesions has proved to be a complex subject due to the lower angiographic success rates, higher complication rates and increased risk of restenosis.[1,2,3,4]

Incidence of Bifurcation lesions is around 15-20% of all cases undergoing coronary intervention procedures.[5] Little was known about the correct approach to treat such lesions until the last five years over which a number of randomized trials have polished our knowledge regarding bifurcation treatment.[6,7] Previous studies show that there is a high burden of additional costs for devices; stents and balloons, large contrast and prolonged screening time, higher incidence of MACE and restenosis when compared to MV stenting alone.[8-10] Over the past few years, Drug Eluting Stents(DES) have been found to lessen restenosis rates(2-4%) as compared to bare metal stents(BMS)(26%)[6], although long term outcome with DES still remains a controversy in the treatment of SB lesions.[11-13] There are a few two stenting techniques at our disposal for the treatment of the SB lesions such as crush, mini-crush, final kissing, T stenting, Tap technique and culotte stenting.[14-17] The Nordic Stent Technique Study compares Crush with culotte stenting, with no difference in terms of death, post procedure MI or revascularization at Six months clinical follow up, however the incidence of periprocedure MI and in-stent restenosis was higher with crush technique.[6] Most data at present suggest no clear advantage for routine double stenting over a provisional strategy for SB with regards to restenosis, thus there is a consensus in the interventional community that DES implantation using a provisional approach is the gold standard for treating bifurcations.[18-20] We put this assumption to test by studying the efficacy and safety of stenting the MV alone as opposed to stenting both MV and the SB in 133 patients operated at our centre.

METHODOLOGY

A retrospective analysis of 133 patients, operated between Oct 2009 and Sept 2010, with true coronary bifurcation lesions was carried out using the registry at Army Cardiac Centre Lahore. All angiograms and case notes were reviewed for sites of lesions, MADINA classification, angle of bifurcation, size of MV and of SB, number and type of stents used, total procedure time, TIMI flow, and patient characteristics. Pre and post-procedure outcomes were followed by recording the In-hospital MACE events of all patients. 6 months follow up was not carried out. Bifurcation lesion was defined as lesions involving both the main vessel and side branch. Madina classification system was used for Bifurcation Lesions. Critical Lesion was lesions with >70% stenosis.

The data was collected and analyzed using the spss 16.0. Chi-square test was applied for statistical analysis where required.

RESULTS

Of the 133 cases undergoing PCI, Table 1 shows the patient characteristics.

Majority (65.4%) of the Side Branches had an angle of <75. Mean diameter for MV was 3.17mm while that for SB was 2.15m. Only 9% of the cases had side branches that were critically stenosed before intervention. The average procedure time was 11 minutes, 12 seconds. 114 cases (85.7%) were found to have Madina Classification 111 while only 19 cases were found to have Madina Classification 101 as shown by table 3. Distribution of bifurcation lesions were LAD/DIG (56.4%), CX/OM (19.5%) and RCA/PDA (24.1%) as depicted in Figure 1. In 28 (20.05%) cases, both the SB and MV were wired. Table 2 highlights these lesion characterisitics 13 (9.77%) of the 133 cases underwent dual stenting (SB and MV) while the remaining 120 had stenting in the MV only.

Table 1: Patient Characteristics (n=133)

Characteristic	Description	N (%)
Gender	Male	118 (88.7)
	Female	15 (11.3)
Risk factors for IHD	Hypertension	63 (47.3)
	Diabetes Mellitus	40 (30.0)
	Smoking	45 (33.8)
	Family History of IHD	14 (10.5)

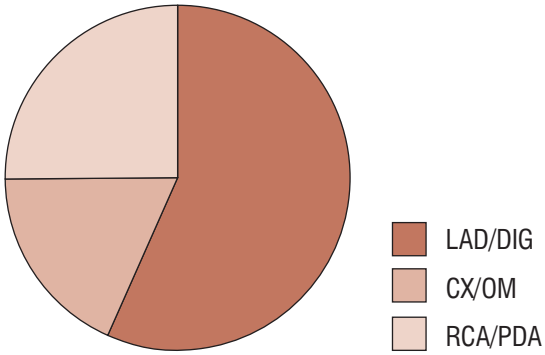
All 13 (9.77%) of the SB cases underwent stenting with DES, while majority (106) of the MV cases also had DES deployed. Out of the 13 SB lesions that were stented, 8 were located at the LAD/DIG junction. For the SBs that were stented, mini crush Technique was used for 53.8%, simultaneous Kissing (SKS) 7.7%, T stenting 23.1% and Tap stenting 15.4%.

Mean total Radiation exposure time for Main vessel only stenting was 7±1 minutes as opposed to 15± 2 minutes for those cases in which double stenting was carried out with final kissing. Mean contrast exposure for Main vessel only stenting was 203±4 ml as compared to 379±6 ml for double stenting. In only 3 cases we were unable to recross the side branch. We attempted final kissing in all cases except those 3 cases in which we were unable to recross the side branch.

In-hospital MI rate for SB stents was 15.4%(p=0.009), as opposed to none for MV only stents. There was no in-hospital death recorded in either group.

The incidence of MI with respect to the different stent techniques employed is shown in Table 3.

Figure 1: Site of Lesion



LAD: Left Anterior Descending, DIG: Diagonal, CX: Circumflex, OM: Obtuse Marginal, RCA: Right Coronary Artery, PDA: Posterior Descending Artery

Table 2: Lesion Charactertistics

Characteristics	Description	N(%)
Site of lesion	LAD/DIG	75 (56.4)
	CX/OM	26 (19.5)
	RCA/PDA	32 (24.1)
Madina Classification	111	114 (85.7)
	101	19 (14.3)
Mean Diameter Main Vessel (MV)	3.17mm	-
Mean Diameter Side Branch (SB)	2.15mm	-
critical stenosis	-	12 (9)
SB angle	<75	87 (65.4)
	>75	45 (33.8)
Intervention	MV & SB	13 (9.8)
	MV	120 (90.2)

Table 3: Stent Techniques and In Hospital MI Rate (n=13)

Stent Technique	Total Cases(n)	In Hospital MI(n)
SKS	1	1
Mini crush	7	1
T stenting	3	1
Tap technique	2	-

DISCUSSION

On account of the financial constraints in our region, same issues have also been faced by many other practitioners as observed from published data [8-9]; we preferred the use of single stent technique over provisional side branch stenting in most cases at our centre. However, double stent technique was used only for cases with SB size >2.5mm, madina classification 111 with significant ostial stenosis or high grade stenosis just distal to the bifurcation in the MV that could potentially lead to plaque shift (snow plough effect), the same criteria has also been used by several international practitioners.[14] With regards to double stenting, in our study Tap technique has been found to be more convenient and successful than other techniques used to treat true coronary bifurcations. Our results are the same to the ones published in the Nordic Stent Technique Study[6] (one of the few randomized trials comparing two stent techniques) which shows high periprocedure MI rate (15.5% which is comparable to the outcome of our study). Majority of the patients in our study who developed peri-procedure MI were those in which the crush technique was used especially where we failed to recross into the side branch and hence couldn't do final kissing. We feel that in the absence of strong evidence demonstrating the superiority of one technique over the other the selection of technique is based on the patient's stability, site of bifurcation lesion and physicians familiarity with a specific technique. SKS technique though quicker and more feasible, with the advantage of access to both branches throughout the procedure[21], becomes cumbersome if we need to recross the stents or treat sub acute thrombosis specially if double barrel part is too long which is not without complications in many cases. In our experience we have noticed that because of strong ostial fibers at the site of bifurcation high pressure simultaneous kissing inflation using non compliant balloons was invariably required in majority cases using SKS technique. Whereas, using the crush technique it is rather difficult, sometimes impossible to recross through the multiple layers of stents making this technique unfavorable. In accordance with published data we found the use of DES for SB stenting to be more convenient.[6] Moreover, dissection proximal to bifurcation is also very difficult to treat, but the problem can be solved with the arrival of the Devax stent which a self-expandable stent allowing the scaffolding of the MV proximal to the bifurcation up to the carina.[22] We have found wiring of both branches as a useful technique as it keeps the flow intact inside the SB and remains an important landmark for re-crossing through the stent into the SB if required.[1] There is substantial disadvantage of using liberally two stents in bifurcation lesion, since it is very costly as compared to single stent technique because using two stents, and two balloons sometimes more, increases the cost of the procedure more than 2 folds. As shown by a few vital meta-analysis of randomized studies, the in-hospital MACE for SB stenting was higher as compared to MV only stenting as has also been shown in our study as well[3,4,10].

CONCLUSION

Our study shows that stenting of only MV is safer, effective and economical than stenting of both MV and SB unless indicated only in carefully selected cases. Stenting in MV alone is less likely to obstruct the jailed SB obviating the need for stent in the SB, especially if SB ostium is healthy with angulation of SB >75. Moreover amount of contrast used and risks of radiation are much less with stenting the MV in the treatment of coronary bifurcation as compared to stenting of both MV and SB. In conclusion provisional stenting of the SB is more appropriate than elective stenting while making the strategy to treat coronary bifurcation.

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