Multiple/Overlapping Stents in a Single Artery Territory in Bangladeshi Patient Population with Diabetes Mellitus (DM)-Sirolimus Eluting Stent (Cypher) shows better Patency and Reduced ISR: A Single Center Experience

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Abstract

Background: *Data of stent patency or the development of ISR in multiple or overlapping stent in a single vessel territory of Bangladeshi diabetic (DM) patient population is not yet available. Therefore, the aim of our present study was to assess primarily the long-term stent patency of varieties of stent in patient with Diabetes Mellitus (DM) and Non-diabetes Mellitus (NDM).*

Methods: *Patients were prospectively selected from, who underwent coronary angiogram at our hospital for further evaluation of their previous PTCA in the e"36 months preceding the study for the quantifying period of 2007-2011. Total 51 (11%) patients (male: 41, Female: 10) from a total 461 patients were included in this study who has multiple or overlapping stent in single vessel territory. Total 32 (62.7%) patients included into the DM group with an average age of 57 yrs and in the NDM were 19 (37.3%) with 58 yrs. Average ISR period was 3.1 ± 2.4 yrs.*

Results: *Our result shows that total 70 stent were deployed in 33 vessels of DM patient and 44 stent in 21 vessel of Non-DM patient. Territory wise total number of deployed stent in patient of DM: NDM were in LAD 34 (48.6%): 18(41%), RCA 16 (22.8%): 4 (9%) and LCX 20(28.6%): 22(55%). Stent used in DM: NDM; were BMS 21 (30%): 22(50%), Sirolimus 24(34.3%): 10(22.7%), Paclitaxel 17(24.3%):8(18.2%), Everolimus 6(8.6%):4(9.1%)%). Re-look coronary angiogram (CAG) revealed that increased number of in-stent restenosis occurred more in patient with Diabetes [DM 10(31.3%) vs NDM 5(26.3%)]. Significant ISR (ISR>60%) in DM patient treated with for BMS were 4 (36.4%), for Paclitaxel 3(42.3%), for Sirolimus 1(9.1%). Average stent size and length were almost same in both groups for any coronary territory.*

Conclusion: *Our study has revealed that increased number of ISR were more in patient with diabetes (DM) in a single artery territory when multiple stents were used either separately or as overlapping. Among the stent used, Sirolimus shows better patency with reduced ISR than Paclitaxel and other limus eluting stent for an average period of follow up of 3.1 yrs.*

(Cardiovasc. j. 2012; 5(1): 18-22)

Introduction:

Diabetes mellitus is a pandemic that currently affects more than 150 million people worldwide and common life-threatening illness of increasing prevalence.[1] It is associated with increased risk of Coronary artery disease[2] and is a consistent predictor of mortality, myocardial infarction and elevated rates of restenosis after stenting.[3] Diabetes mellitus is associated with accelerated development of atherosclerosis, more diffuse coronary artery disease in often smaller native vessel, and nontrivial platelet resistance to antiplatelet therapy secondary to diabetic thrombocytopathy, all of which contribute to the increased cardiovascular morbidity and mortality.[4] Revascularization procedures in this setting present worse long-term outcomes and increased restenosis rates than those in non-diabetic patient.[3, 5] Approximately 25-30% of all percutaneous coronary interventions performed annually[6] are in diabetic patient. With the advent of Drug eluting stents reduces restenosis in

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comparison with bare metal stents in diabetic patients.[7] Among the 1st generation DES, SES is safe, effecious and superior than compare to PES in patient with diabetes.[8] Among the 2nd generation DES, Everolimus is not inferior to SES in reducing angiographic restenosis and clinical outcome.[9] Data on Multiple or overlapping stent in a single vessel territory in diabetic Bangladeshi is not yet available. Therefore, the aim of our present study was to assess primarily the long-term patency of multiple or overlapping stent in patient with Diabetes Mellitus (DM) and Non-diabetes Mellitus (NDM).

Methods:

Patients were selected from those who underwent routine coronary angiogram for further evaluation of their coronary status. Most of the patient population in this study had percutaneous coronary intervention (PCI) either with bare metal stent or drug eluting stent in the preceding 3-36months. Eligible patients had a history of stable or unstable angina or documented / silent myocardial infarction. The target lesion for study was an instent coronary arterial lesion between 15 mm and 40 mm with 2.5-4.0 mm in diameter.

Procedure: CAG was performed as per standard protocol. Individual discretion was applied as per operator's choice, depending on patient's problem. Details of the previous procedure were collected from patient's old papers. These included indication, stent detail, complication etc. Whenever possible, old angiogram was also reviewed and compared to the current cine angiogram.

Data: Data were presented as mean ± SD with percentage. Edge re-stenosis was defined as greater than 50% narrowing in the 5mm immediate or distal to the treated region. ISR of significance was also defined as >50% was of lumen inside the stent.

Results:

Our results show that, 11% (51) patient has multiple stent in single coronary territory. Among the studied population, 41 were Male and 8 were female. Table 1. showing the profile and clinical data of studied population in DM vs NDM. For age (DM 57.0 ± 9.8 vs NDM: 58.5 ± 14.3). Both group patients were obese with average BMI 26. Systolic and diastolic BP was almost same in both groups. Average number of CAD risk factors was higher in DM than NDM (3.1± 0.8 vs 2.3 ± 0.2).

Table-I

Profile of studied patient population

	DM	NDM
Age (yrs)	57.0±9.8	58.5±14.3
BMI(kg/m^2)	26.0±2.5	26.0±4.0
SBP(mmHg)	135±13.3	134±17.0
DBP(mmHg)	78.4±7.6	77.3±7.0
No. RF	3.1±0.8	2.3±0.2

Data were presented as Mean ± SD

Table II. showing among the studied population DM 32 (62.7%) vs NDM 19(37.3%). Total stented vessels were 54 (DM 33: NDM 21). Total 114 stent deployed in DM 70 vs NDM 44 as overlapping and or multiple stent in a single coronary territory. Average duration to develop ISR was 3.1 ± 2.4 yrs.

Table-II

Number of stent used in total vessel

DM:NDM	DM 32 (62.7%)	NDM 19 (37.3%)
Total 51 of 461 i.e.; (11%)	Male: 41 (80.4%)	Female: 10 (19.6%)
Total vessel: 54 (DM33:NDM21)	Stent: 114(DM 70:NDM 44)	

Table-III

Average size of Stent used with inflation pressure

	Length (mm)	Diameter (mm)	Inflation Pressure (ATM)
LAD	43.5±11.4	2.98±0.3	13.7±1.4
LCX	42.9±16.0	2.8±0.3	14.0±1.5
RCA	50.0±16.7	3.0±0.3	13.6±1.8

Data were presented as Mean ± SD

Table III, showing the average length of the stent in (LAD: 43.5 ± 11.4; LCX: 42.9 ± 16.0; RCA 50 ± 16.7) and diameter (LAD 2.98 ± 0.3 LCX 2.8 ± 0.3; RCA: 3.0 ± 0.3.) and stent deployment pressure were LAD:13.7 ±1.4, LCX: 14.0± 1.5, RCA: 13.6 ±1.8

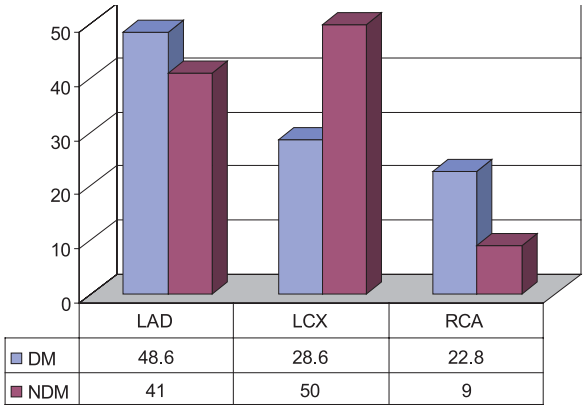

Fig.-1: *Territory wise Percentage Distribution of total number of stent*

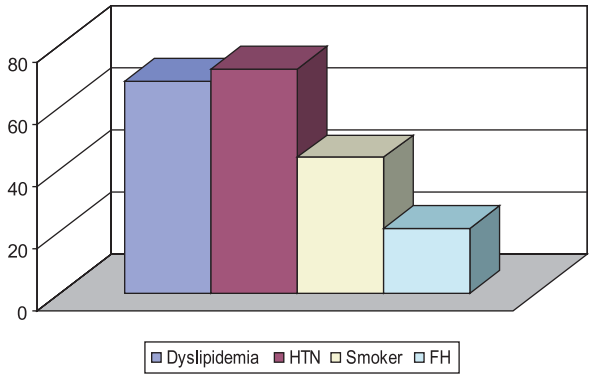

Fig.-2: *Percentage of distribution of CAD Risk Factors*

Fig. I showing the coronary artery territory wise percentage distribution of total number of stent used in both DM and NDM. Fig 2. showing that among the studied population 72.5 HTN were in 72.5%, Dyslipidemia in 68.6%, positive FH in 21%

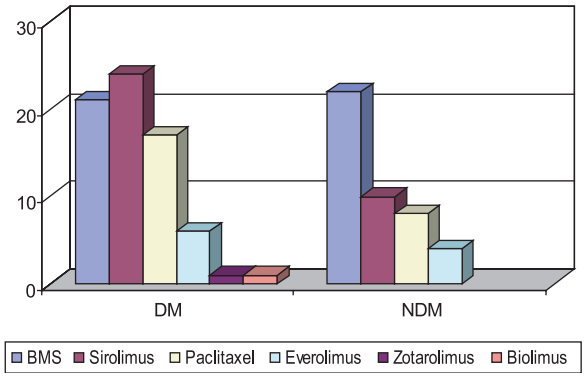

Fig.-3: *Number of Different Type of Stent used*

and smoker in 43.9% patients (all male). Fig. 3 showing the different stent in number used in both DM and NDM patient. Stent used in DM: NDM; were BMS 21 (30%): 22(50%), Sirolimus 24(34.3%): 10(22.7%), Paclitaxel 17(24.3%):8(18.2%), Everolimus 6(8.6%):4(9.1%)%).

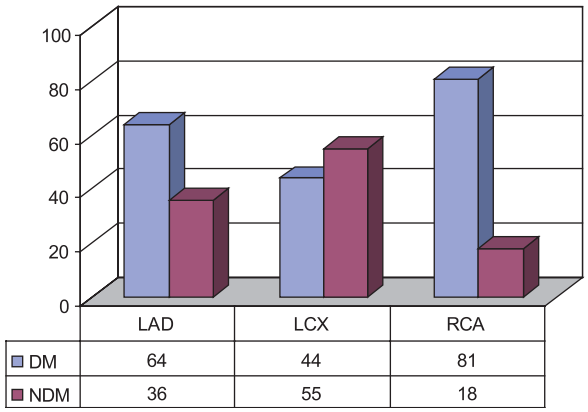

Fig.-4: *Percentage distribution of Common stented territory*

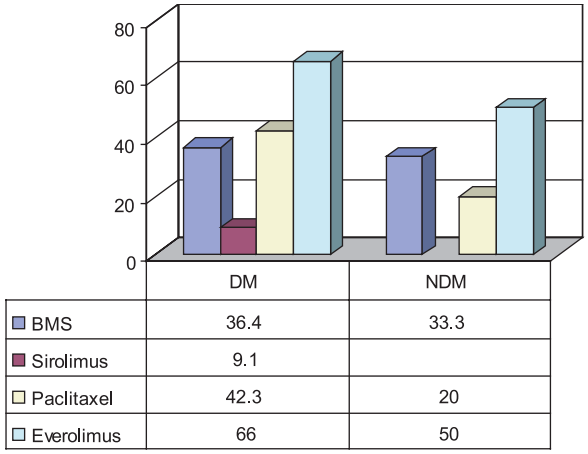

Fig.-5: *Percentage Distribution of development of ISR*

Fig 4. Shows the percentage distribution of common stented territory. Fig 5. Showing percentage wise distributions of the development of ISR, which was less in Sirolimus-eluting stent treated patient with DM. Re-look coronary angiogram (CAG) revealed that increased number of in-stent restenosis occurred more in patient with Diabetes; DM 10(31.3%) vs NDM 5(26.3%). Significant ISR (ISR>60%) in DM patient treated with; for BMS were 4 (36.4%), for Paclitaxel 3(42.3%), for Sirolimus 1(9.1%).

Discussion:

Data on overlapping or multiple stent in a single coronary artery territory in Bangladeshi patient population are not available. Among the different stents, which stent type is suitable in diabetic patient with increase stent patency and reduced ISR were not well known. Investigator has shown, that Drug eluting stents significantly reduced angiographic restenosis and cardiac events compared with BMS in Diabetic patients.[8] In the era of DES, Presence of DM associated with higher neointimal hyperplasia, restenosis and unfavorable clinical outcomes.[10] Moreover, diabetic patients often present unfavorable coronary anatomy with small and/ or diffusely diseased vessel[11] and exhibit exaggerated neointimal hyperplasia after bare metal stent implantation than compared to non-diabetic patients.[12] Although DES significantly reduced the neointimal hyperplasia and angiographic restenosis compared with bare metal stents in DM patients,[8] the presence of DM continues to be associated with an increased risk of restenosis and unfavorable clinical outcomes in the DES era.[13] Several studies has shown, that SES to have promising efficacy than compare with PES in DM patients.[14-16] LEE et al[17]has shown that the 1st generation DES Sirolimus Eluting Stent (Cypher) is superior in reducing angiographic restenosis and improving 9-month clinical outcomes in patient with DM and coronary artery disease with Paclitaxel Eluting Stents implantation. The restenosis rate of ISAR-DIABETES (The Intracoronary Stenting and Angiographic Results: Do Diabetic Patients Derive Similar Benefit from PES and SES, a randomized study comparing SES and PES in Diabetes patients, was 4.9% in SES and 16.5% in PES patients.[16] Even, in longer lesion of patient with DM, SES shown its superiority over PES than ISAR-DIABTES.[17]

Kim WJ[9] has shown that the 2nd generation Everolimus Eluting stents were non inferior to Sirolimus-eluting stents in reducing in-segment late loss reduced angiographic restenosis at 8 months in patients with diabetes mellitus and coronary artery disease.

We found that the 1st generation Sirolimus Eluting stent has reduced instent restenosis with increased stent patency for the designated period of 3.1yrs. Because of the very small number, the long-term patency of the 2nd generation drug eluting stent with reduced ISR was not understood well. In this, regard we need more Diabetic patient inclusion and carried out comparative study.

It is well known that Diabetes mellitus has been reported to be associated with antiplatelet resistance.[18] This is explained by aggressive atherosclerosis, abnormal endothelial function, impaired fibrinolysis, increased platelet activity is considered critically involved in the increased thrombogenic potential among diabetic patients. These findings might be associated with an increased risk of stent thrombosis after coronary stenting.[19]

To treat long lesion, operators favor an overlap strategy because of the practical difficulties with abutting stents, coupled with concerned over gaps or genomic miss. The biologics effects of multiple drug dosing may also impact on the vascular biology of patients. Theoretical concerns related to the use of overlapping drug-eluting stents include the potential toxic effect of increased doses of a drug on vascular endothelium[20] which may result in positive remodeling and aneurysm formation, and possible late stent thrombosis as a consequence of incomplete re-endothelization. Potential adverse reactions to a polymer delivery system in terms of implantation and thrombogenic effects[21] any also increase with overlapping stents.

Conclusion:

Overlapping stents in a single coronary artery lesion carries a risk of restenosis, especially in patient population of diabetes mellitus. Several studies have shown the promising result of different DES in treating long, diffuse and small in caliber coronary of diabetes patient. Among them, many has shown the potential better outcome with reduced ISR in Cypher Sirolimus eluting stent and non-inferior results by 2nd generation Everolimus-eluting stent. It is difficult to conclude in this present prospective cohort which DES is better in our patient with diabetes mellitus. We need more data and multicenter registry in Bangladesh.

Study Limitation:

Most of our studied patients had their PCI done either with BMS or DES in other centers. We had to depend on the reports provided by the patients.

Although they all included stent details, procedural details were missing. We eventually got only information about the type of stent used and few other details.

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