ORIGINAL ARTICLE

Frequency of in-Stent Restenosis in patients having DES, with Stent Length Greater than 30mm Presenting to Tertiary Care Center

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ABSTRACT

Objective: The purpose of this study was to calculate the incidence of in-stent restenosis in patients with DES and stent lengths higher than 30mm who presented to a tertiary care hospital.

Study Design: A Cross-sectional study

Place and Duration: This cross-sectional study was conducted at Department of Cardiology, Rashid Latif Medical College, Lahore in the duration from February, 2022 to July, 2022.

Methods: There were 83 patients of coronary artery disease (CAD)were included. After obtaining written consent from participants, researchers collected information about their participants' ages, sexes, body mass indexes, and co-morbidities. Atherosclerosis risk variables were collected with baseline investigations and an echocardiography for ejection fraction determination. Imaging studies were reviewed by board-certified interventional cardiologists, who found evidence of ISR. Past angioplasty information and stent details were recorded.

Results: In our study mean age of the presented cases was 54.13±7.44 years and mean BMI 25.2±13.87 kg/m^2. Most common comorbidity was diabetes found in 25 (30.1%) followed by hypertension in 23 (27.7%) and dyslipidemia in 20 (24.1%) cases. We found that 40 (48.2%) patients were smokers. Mean LDL cholesterol of the patients was 68.6±1.97 mg/dl and mean uric acid was 6.2±2.35 mg/dl. Majority of the cases 45 (54.2%) had poor socio-economic status. We found that frequency of ISR was higher among cases of biomatrix stent 24 (28.9%), followed by Xience stent in 22 (26.5%) cases, Ultimaster stent in 19 (22.9%) and Xlimus stent in 18 (21.7%) cases after coronary angiograpghy. Our results showed that the stents longer than 30mm were associated with a higher incidence of In-Stent Restenosis (p=0.03).

Conclusion: Based on the findings of this study, we came to the conclusion that a previous diagnosis of diabetes mellitus and a longer stent length are both significant risk factors for developing in-stent restenosis. In our research, we found that instances with biomatrix stents had a greater incidence of ISR.

Keywords: CAD, Drug eluting stents (DES), Coronary angiography, In-Stent Restenosis

INTRODUCTION

Restenosis is the process of the arterial lumen becoming more constricted after angioplasty. When bare-metal stents (BMS) were initially utilized to treat coronary artery disease in the middle of the 1990s, a new clinical entity emerged as a consequence. This entity is known as In-Stent Restenosis (ISR). In-stent restenosis (ISR), which is currently defined as a stenosis of a previously stented portion that is more than fifty percent, may develop in as many as thirty percent of all patients who had bare metal stents implanted (BMS). In-stent restenosis (ISR) rates in patients treated with drug-eluting stents (DES) are as high as 10%, despite the introduction of DES and better stent design. This is due to the fact that drug-eluting stents do not completely eliminate the risk of restenosis within the stent. The widespread use of drug-eluting stents (DES) in patients with small arteries, lengthy lesions, complicated coronary lesions, diabetes, and a previous history of bypass surgery may be to blame for the recurrence of restenosis in many of these patients in current clinical practise. [1,2]

Bare-metal stents (BMS) are still widely used, despite the fact that drug-eluting stents (DES) have been shown to be safe and effective in patients undergoing PCI. This is primarily due to the fact that BMS have a lower cost, as well as concerns regarding a debatable increased risk of bleeding associated with prolonged dual antiplatelet therapy after DES [3,4]. In addition, neoatherosclerosis is more typically associated with DES of the first generation than it is with BMS. It also develops several months or years after PCI, while atherosclerosis in native coronary arteries develops over the course of many decades. [5]

When it comes to PCI for ISR, there are a number of challenging barriers that need to be solved. Another feasible option is balloon angioplasty (BA), often known as stent implantation, which may be performed with either BMS or DES stents. The rates of restenosis after balloon angioplasty or stenting with BMS are

high (39%) and similar (38%). [6] Restenosis rates have been observed to be reduced when using DES for BMS ISR, with rates ranging from 13% to 20% for the sirolimus eluting stent (Cypher, Cordis J&J), and from 15% to 22% when using the paclitaxel eluting stent. Both of these stents are manufactured by J&J and Cordis, respectively (Taxus, Boston Scientific). When PCI is done with a different DES for the first DES ISR (particularly when conducted at a later period), the risk of restenosis as well as severe adverse cardiac events is significantly increased (MACE). [6-9]

While the medication is only present at the stent struts, drug-eluting stents (DES) have a limited ability to diminish neointimal hyperplasia between the stent struts as well as at the stent margins. Polymers are utilised to bond the drug, which raises severe concerns regarding the possible adverse long-term effects on biological systems. [10]

When we project these findings to the cardiologists in the area, we may be able to make some suggestions for the future. For example, we might suggest conducting additional studies in a scenario that is very similar to this one in order to establish associations and to continually monitor at-risk populations after PCI. With this knowledge at our disposal, we will be better equipped to bring the morbidity rates associated with PCI and ISR among the adult population in our region down to a more manageable level.

The purpose of this research was to investigate the rate of in-stent restenosis that occurred in patients who were admitted to a tertiary care hospital and had DES with stent lengths that were larger than 30 mm.

MATERIAL AND METHODS

This cross-sectional study was conducted at Department of Cardiology, Rashid Latif Medical College, Lahore in the duration

from February, 2022 to July, 2022 and comprised of 83 patients. After obtaining written consent from participants, researchers collected information about their participants' ages, sexes, body mass indexes, and co-morbidities. Patients who already had kidney or liver failure were excluded from the study.

The study comprised male and female patients aged 25 to 70 who had undergone angioplasty in the past and were currently experiencing Angina or new-onset ACS-related symptoms (as per operational criteria), as well as patients with ISR on repeat angiography. Admittance was followed by the collection of clinical and biological data. Ejection fraction was determined after baseline studies and an echocardiography revealed atherosclerotic risk factors. The diagnosis of ISR was verified by angiogram analysis by board-certified interventional cardiologists. Previous angioplasty information and stent details were recorded. The average and standard deviation were utilised to characterise the continuous variables. For categorical variables, we computed frequencies (n) and percentages (%) to describe their distribution. We employed the Chi-square test with a 95% confidence interval and a 5% margin of error to compare the proportion of ISR between 2nd and 3rd generation drug eluting stents in patients undergoing emergency and elective operations. We considered a p-value less than 0.05 to be statistically significant. SPSS 24.0 was used to analyze all data.

RESULTS

In our study mean age of the presented cases was 54.13±7.44 years and mean BMI 25.2±13.87 kg/m^2. Most common comorbidity was diabetes found in 25 (30.1%) followed by hypertension in 23 (27.7%) and dyslipidemia in 20 (24.1%) cases. We found that 40 (48.2%) patients were smokers. Mean LDL cholesterol of the patients was 68.6±1.97 mg/dl and mean uric acid was 6.2±2.35 mg/dl. Majority of the cases 45 (54.2%) had poor socio-economic status.(table 1)

Table-1: Characteristics of the included cases

Variables	Frequency	Percentage
Mean age (years)	54.13±7.44	
Mean BMI (kg/m^2)	25.2±13.87	
Comorbidities		
DM	25	30.1
HTN	23	27.7
dyslipidemia	20	24.1
Mean LDL (mg/dl)	68.6±1.97	
Mean Uric acid (mg/dl)	6.2±2.35	
Socio-economic status		
Poor	45	54.2
Middle	22	26.5
Higher	16	19.3

As per gender, 58 (69.9%) patients were males and 25 (30.1%) cases were females.(figure 1)
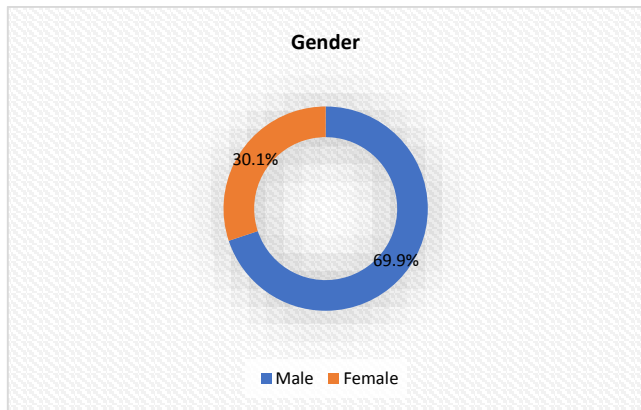

Figure-1: Gender classification among all cases

We found that frequency of ISR was higher among cases of biomatrix stent 24 (28.9%), followed by Xience stent in 22 (26.5%) cases, Ultimaster stent in 19 (22.9%) and Xlimus stent in 18 (21.7%) cases after coronary angiograpghy.(table 2)

Table-2: Rate of ISR in Drug-Eluting Stents

Variables	Frequency of ISR	Percentage
Types DES		
Biomatrix stent	24	28.9
Xience stent	22	26.5
Ultimaster stent	19	22.9
Xlimus stent	18	21.7
Total	83	100

DISCUSSION

Independent of patient presentation and comorbidities, we sought to quantify the prevalence of ISR in the variety of drug-eluting stents larger than 30 mm that have been brought to our centre.

Stent thrombosis and in stent re stenosis are among the most serious complications that can arise following stent implantation. When a stent has thrombosed, the patient experiences sudden, severe chest pain and a myocardial infarction (MI) in the stented artery, while in patients with ISR, the patient experiences stable or unstable angina. Stent thrombosis is a medical emergency that can manifest either acutely or subacutely and is caused by procedural problems such as edge dissection, malapposed stent struts, or poor compliance with dual antiplatelets. A patient's short-term target lesion failure is more likely to be attributable to the surgery itself than to neo intimal hyperplasia or neo atherosclerosis.

Total 83 patients of both genders were presented. In our study mean age of the presented cases was 54.13±7.44 years and mean BMI 25.2±13.87 kg/m^2. Most common comorbidity was diabetes found in 25 (30.1%) followed by hypertension in 23 (27.7%) and dyslipidemia in 20 (24.1%) cases. These results were comparable to the previous studies.[11,12] We found that 40 (48.2%) patients were smokers. Mean LDL cholesterol of the patients was 68.6±1.97 mg/dl and mean uric acid was 6.2±2.35 mg/dl. Majority of the cases 45 (54.2%) had poor socio-economic status. The literature describes a number of lesion and procedure-related variables that can lead to ISR. Among the coronary arteries in our research population, the Left Anterior Descending (LAD) artery was the most likely to develop ISR.

Several research have also found a link between hypertension and ISR, which is consistent with our findings. Among 289 patients in a retrospective analysis, Wihanda et al. [13] found that hypertension was a risk factor for ISR in patients after PCI. The authors (Mohan and Dhall) also discovered a positive and statistically significant relationship between hypertension and ISR. [14]

Although the exact mechanism that raises diabetic patients' ISR risk remains unclear, a recent study in animals found that insulin and, additionally, insulin receptors are principally responsible for the increased intimal hyperplasia in diabetes, which is directly linked to the restenosis phenomena. These findings come as a surprise since they contradict the findings of numerous prior research that suggest another component, insulin-like growth factor-1, has a more significant role[15]. Diabetes mellitus has been included in the list of risk factors for ISR due to the physiopathological mechanism described in the literature and the higher prevalence of diabetes in our patients with ISR compared to those without.

The newer DES were made to reduce the re-stenosis rate and provide better stent delivery to the lesion site. These alterations include new medications (zatorolimus, biolimus) and improvements to the stent's platform (e.g., stainless steel struts versus cobalt chromium struts), polymer (thinner and/or biodegradable), and implantation techniques (luminal VS abluminal drug coating). Compared to the original paclitaxel-eluting stent (PES), the newer generation Everolimus eluting stents have been

shown to be more effective in reducing thrombosis and the need for further revascularization procedures. [16,17]

We found that frequency of ISR was higher among cases of biomatrix stent 24 (28.9%), followed by Xience stent in 22 (26.5%) cases, Ultimaster stent in 19 (22.9%) and Xlimus stent in 18 (21.7%) cases after coronary angiograpghy. Our results showed that the stents longer than 30mm were associated with a higher incidence of In-Stent Restenosis (p=0.03).[11,12] Active pharmacologic medication, stent plat shape, and drug carrier are the three main components of a drug eluting stent that contribute to its efficacy. Within the first 30 days after artery injury, newer DES designs allow for the controlled release of medicines that are anti-inflammatory, immunological modulatory, and/or antiproliferative at the site of injury.[18,19]

CONCLUSION

Based on the findings of this study, we came to the conclusion that a previous diagnosis of diabetes mellitus and a longer stent length are both significant risk factors for developing in-stent restenosis. In our research, we found that instances with biomatrix stents had a greater incidence of ISR.

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