Clinical Outcomes from Unselected Real-World Patients with Acute Myocardial Infarction Receiving Biodegradable Polymer Coated Sirolimus-Eluting Stents

D. Rajasekhar[1,*], V. Vanajakshamma[1], Sarath Babu[1], C. Sivasankara[1] and Ashok Thakkar[2]

[1]*Sri Venkateswara Institute of Medical Sciences (SVIMS), Tirupati, Andhra Pradesh-517507, India*

[2]*Sahajanand Medical Tech. Pvt. Ltd., Surat, India*

Abstract: *Objectives*: To investigate clinical outcomes of acute myocardial infarction population in a real-life setting when treated with Indolimus® biodegradable polymer coated sirolimus-eluting coronary stent.

Background: Drug-eluting stents in acute myocardial infarction are still feared for possible late and very late stent thrombosis. Newer antiproliferative drugs and more biodegradable polymers have shown promise in reducing further the rate of late stent thrombosis in patients with stable angina. However, limited data is available on the safety and efficacy of biodegradable polymer coated drug-eluting stent in acute myocardial infarction patients.

Methods: We studied patients undergoing cardiac catheterization with acute myocardial infarction (n=239) and without acute myocardial infarction (n=291) who had been implanted with Indolimus® sirolimus-eluting stents. The outcomes were reported for 1 and 6-months. The primary endpoint was the composite of major adverse cardiac events at 1 and 6-months after discharge from hospital. The secondary endpoint was stent thrombosis.

Results: A higher proportion of patients in the acute myocardial infarction group had renal insufficiency at screening (p=0.02), but there was a higher proportion of patients with a history of myocardial infarction (p<0.001), previous percutaneous coronary intervention (p=0.01) in the non- myocardial infarction group. The frequency of type B2/C lesions (p<0.001) and chronic total occlusion (p<0.001) was higher in the myocardial infarction group. There was no significant difference in parameters related to target vessel distribution and severity of disease. The six months follow-up was completed for 516 (97.4%) enrolled patients. The incidence of any major adverse cardiac events at 6-months was 2.1% and 4.2% for non-myocardial infarction and myocardial infarction population, respectively. There was no stent thrombosis up to 6-months in both groups.

Conclusions: In this all-comer, real-world Indolimus acute myocardial infarction study, major adverse cardiac events rates did not differ between acute myocardial infarction and non-acute myocardial infarction population. Six-month observation of acute myocardial infarction treatment using Indolimus® stent compared with non- acute myocardial infarction has no clinical disadvantage.

Keywords: Acute myocardial infarction, Percutaneous Coronary Intervention, Sirolmus-eluting stent, biodegradable polymer.

INTRODUCTION

First-generation drug-eluting stents (DES) have been demonstrated to be superior to bare-metal stents (BMS) in reducing the need for repeat revascularization for the treatment of obstructive coronary artery disease [1]. Despite these results, the concern for increased late stent thrombosis is still present [2-4]. This finding may be due to delayed vascular healing after DES implantation, probably as a result of drug and/or polymer reaction [5, 6].

Some studies showed that DES had a higher rate of stent thrombosis compared with BMS even long after the index procedure [7]. Other studies revealed that the polymers of the first-generation DES were associated with local allergic reactions, inflammation, and delayed endothelialization, leading to early and late stent thrombosis [8]. Therefore, second-generation DES with new stent platforms, polymers, and drugs has been developed with the goal to further improve upon the safety profile of first-generation DES while maintaining efficacy.

However, concerns have been raised with regard to the safety of DES, especially in the acute myocardial infarction (AMI) setting. Pathological investigations claim that there are risks with DES for AMI during percutaneous coronary intervention (PCI) [9-11]. Because AMI presents the highest possible thrombotic coronary lesions, DES implantation during primary PCI for AMI is still not advocated by many interventional cardiologists.

The Indolimus® (Sahajanand Medical Technologies Pvt. Ltd., Surat, India) uses L605 cobalt chromium (Co-Cr) alloy as its stent platform which is coated with a biodegradable polymer to deliver sirolimus. The

*Address correspondence to this author at the Department of Cardiology, Sri Venkateswara Institute of Medical Sciences (SVIMS), Tirupati, Andhra Pradesh-517507, India; Tel: +91-8772288133; E-mail: drdrsekhar@yahoo.co.in

E-ISSN: 2311-052X/13

primary aim of this single-centre, non-randomised, retrospective study was to investigate the clinical outcomes of the AMI population in a real-life setting when treated with Indolimus® biodegradable polymer coated sirolimus-eluting coronary stent.

METHODS

Study Design and Patient Population

Indolimus AMI is a single-centre, non-randomised, retrospective study that has been investigating the clinical outcomes of the AMI population in a real-life setting.

Inclusion Criteria

All the patients attended to Sri Venkateswara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India during August 2012 and March 2013 and implanted with Indolimus® sirolimus-eluting stent (SES) were included in the study.

Exclusion Criteria

Patients were excluded if they had known allergy to aspirin, clopidogrel, ticlopidine, heparin, sirolimus, cobalt chromium and polymers.

Depending upon AMI status, patients were divided into two groups. 1) Patients with MI 2) Patients without AMI. If the patient had raised cardiac biomarker with one of the following: 1) had Symptoms of ischaemia, 2) New or presumed new significant ST-segment–T wave (ST–T) changes or new left bundle branch block (LBBB),3) Development of pathological Q waves in the ECG, 4) Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality, 5) Identification of an intracoronary thrombus by angiography, we had accommodated the patient in AMI group.

During the study period, we enrolled a total of 530 patients who underwent Indolimus® sirolimus-eluting stent at the centre and we had divided them in to group I (with AMI, n=239 patients) and group II (without AMI, n=291 patients).

The study protocol was approved by the institutional ethics committee and a signed informed consent was obtained from each enrolled patient.

Description of the Study Stent

The Indolimus® biodegradable polymer coated sirolimus-eluting coronary stent (Sahajanand Medical Technologies Pvt. Ltd., Surat, India) consist of L605 Co-Cr alloy as its stent platform having strut thickness of 60 µm with biodegradable polymers and drug load of 1.4µg/mm^2. About 70% of drug is released within 7 days and remaining drug is released over a period of 48 days. The drug is released within 7 weeks after the stent implantation from the polymeric layers coated onto the surface of the stent. The biodegradable polymeric film is a blend of different biodegradable polymers which undergoes hydrolysis. This process takes approximately 9 to 12 months after which all the polymer degrades naturally and excretes from body. The coating layer comprises of drug sirolimus blended together with biodegradable polymeric matrix. This matrix includes different biodegradable polymers - Poly L-Lactide, 50/50 Poly DL Lactide-co-Glycolide and Polyvinyl Pyrrolidone to control the drug elution from stent coating. After releasing the drug within 48 days, these polymers eventually degrade naturally and are excreted from the body in the form of their metabolites. The average coating thickness of Indolimus® stent is between 5 to 6 µm. Indolimus® stent is available in lengths of 8, 12, 16, 20, 24, 28, 32, 36 and 40 mm and available diameters are 2.5, 2.75, 3.0 and 3.5 mm.

PCI Procedure and Medical Treatment

The diagnosis of AMI was based on clinical presentation, ECG findings and cardiac enzyme studies (new ST-segment elevation, development of Q waves or left bundle branch block on ECG, or biochemical evidence of necrosis such as total creatinine kinase >twice the normal upper limit with an elevated creatine kinase-MB isoenzyme or a positive troponin).

Diagnostic angiography and PCI were performed through either femoral or radial artery after administration of unfractionated heparin (70 to 100U/kg). Patients received unfractionated heparin to maintain the activated clotting time of >250 s during the procedure. Stents were deployed after prior balloon angioplasty, and the use of cilostazol or platelet glycoprotein IIb/IIIa receptor blockers was left to the discretion of the individual operator. Following PCI, recommended dual antiplatelet regimens was prescribed. Every patient received daily minimum 75-150 mg aspirin for one year after which aspirin 75 mg daily was recommended lifelong plus minimum 75 mg clopidogrel for 12-months. Longer duration antiplatelet therapy of clopidogrel was left to the discretion of the investigator.

Study Endpoints and Definitions

The primary endpoint was the composite of major adverse cardiac events (MACE) including cardiac death, myocardial infarction (MI) and target lesion revascularisation (TLR) at both 1 and 6-months after survival discharge from hospital. The secondary endpoint was stent thrombosis. Deaths were classified as cardiac or non-cardiac. Deaths from undetermined causes were reported as cardiac. MI was diagnosed on the basis of the development of new Q-waves of more than 0.04 seconds in two or more contiguous leads, accompanied by a significant increase in the creatine kinase or MB isoform or troponin I or T levels; non-Q-wave infarction was diagnosed as an increase in the creatine kinase level to more than three times the upper limit of the normal range with an accompanying elevation in the MB isoform or troponin I or T levels without development of new-Q-waves [12]. TLR was defined as ischemia-induced PCI of the target lesion due to restenosis or re-occlusion within the stent or in an adjacent 5 mm of the distal or proximal segment. Target vessel revascularization (TVR) was defined as clinically driven PCI of the target lesion or any segment of the coronary artery containing the target lesion. Stent thrombosis was defined according to the Academic Research Consortium (ARC) definitions and categorized according to the timing of the event as acute (occurrence within the first 24 h after the index procedure), subacute (from 24 h to 30 days), and late (from 30 days to 1 year) [12].

Data Collection and Clinical Follow-Up

The cardiovascular risk factors and past history records (age, sex, hypertension, smoking, diabetes mellitus, previous MI, previous PCI and previous stroke) were recorded by self-report of the patient, but the final records were left to physician discretion after he or she had comprehensively considered the patient self-report and in-hospital examination results. Patients were required to visit the department of cardiology at the end of the 1 and 6-months after the PCI procedure as well as whenever angina-like symptoms occurred. At the time of follow-up contact, data were collected pertaining to current clinical status, prior hospitalisation and occurrence of any of the aforementioned adverse events.

Statistical Analysis

Statistical analyses were performed with the use of Statistical Package for the Social Sciences (SPSS) version 15 (IBM SPSS, Inc. in Chicago, Illinois). Continuous variables are expressed as means ± standard deviation (SD) and categorical data are presented as frequencies. For comparisons between groups, the chi-square test, Fisher's exact test, or the Wilcoxon rank-sum test was used as appropriate. The cumulative incidence of adverse events was estimated according to the Kaplan–Meier method and compared by the log rank test. A p-value less than 0.05 were considered statistically significant.

RESULTS

Patient and Lesion Characteristics

Patient characteristics of the two groups are shown in Table **1**. The rates of hypertension was more common in non-AMI group (Non-AMI: 132 (45.4%), AMI: 83 (34.7%), *p*=0.02). A higher proportion of

Table 1: Baseline Demographics Characteristics

Characteristics	Non-AMI (*n* = 291 patients)	AMI (*n* = 239 patients)	*p*-Value
Age (mean ± SD, yrs)	54.8 ± 10.6	55.0 ± 11.0	0.95
Age ≥ 60 yrs, n (%)	98 (33.7%)	86 (36.0%)	0.58
Male, n (%)	225 (77.3%)	190 (79.5%)	0.60
Diabetes Mellitus, n (%)	99 (34.0%)	70 (29.3%)	0.26
Hypertension, n (%)	132 (45.4%)	83 (34.7%)	0.02
Smoker, n (%)	140 (48.1%)	133 (55.6%)	0.10
Tobacco chewer, n (%)	10 (3.4%)	7 (2.9%)	0.81
Alcoholism, n (%)	65 (22.3%)	65 (27.2%)	0.22
Renal insufficiency at screening, n (%)	8 (2.7%)	17 (7.1%)	0.02
Previous Stroke, n (%)	7 (2.4%)	5 (2.1%)	1.00
Previous MI, n (%)	46 (15.8%)	10 (4.2%)	<0.001
Previous PCI, n (%)	13 (4.5%)	1 (0.4%)	0.01

Table 2: Lesion and Procedural Characteristics

Characteristics	Non-AMI *Patients* = 291 / *Lesions* = 340	AMI *Patients* = 239 / *Lesions* = 277	*p*-Value
Lesion Location			
Left Anterior Descending, n (%)	195 (57.4%)	139 (50.2%)	0.09
Right Coronary Artery, n (%)	88 (25.9%)	85 (30.7%)	0.21
Left Circumflex, n (%)	57 (16.8%)	53 (19.1%)	0.46
ACC/AHA type B2/C, n (%)	174 (51.2%)	217 (78.3%)	<0.001
Chronic Total Occlusion, n (%)	45 (13.2%)	94 (33.9%)	<0.001
No. of Diseased Vessels			
Single Vessel Disease, n (%)	198 (68.0%)	172 (72.0%)	0.39
Double Vessel Disease, n (%)	90 (30.9%)	64 (26.8%)	0.34
Triple Vessel Disease, n (%)	3 (1.0%)	3 (1.3%)	1.00
Total no. of stent	n=343	n=283	-
No. of stents per patient, (mean ± SD, mm)	1.18 ± 0.39	1.18 ± 0.40	0.89
Number of stents per lesions, (mean ± SD, mm)	1.01 ± 0.11	1.02 ± 0.13	0.52
Average Stent Length, (mean ± SD, mm)	18.8 ± 6.5	18.7 ± 5.4	0.54

patients in the AMI group had renal insufficiency at screening (Non-AMI: 8 (2.7%), AMI: 17 (7.1%), p=0.02), but there was a higher proportion of patients with a history of MI (Non-AMI: 46 (15.8%), AMI: 10 (4.2%), p<0.001), previous PCI (Non-AMI: 13 (4.5%), AMI: 1 (0.4%), p=0.01) in the non-AMI group.

Lesion characteristics are presented in Table **2**. The frequency of type B2/C lesions (p<0.001) and chronic total occlusion (p<0.001) was higher in the AMI group, but there were no significant differences in parameters related to target vessel distribution and severity of disease.

Clinical Outcomes

Cumulative clinical outcomes up to 6-months are listed in Table **3**. At 1-month the incidence of MACE was not significantly different between the two groups (Non-AMI: 5 (1.7%), AMI: 5 (2.1%), p=0.76). The incidence of any MACE at 6-months was 6 (2.1%) and 10 (4.2%) (p=0.20) for non-AMI and AMI population, respectively. At both 1 and 6-months the incidence of MACE was not significantly different between the two groups. There was no stent thrombosis up to 6-months in both groups.

Event frequency curve for cardiac death is shown in Figure **1**. The long term follow-up is ongoing to confirm additional safety in AMI patients.

DISCUSSION

DES has rapidly and profoundly affected the field of interventional cardiology, being now used in the majority of intracoronary stenting procedures. As a result of many “trial-and-error” endeavours, DES has emerged as a potential solution for solving the problem of restenosis. Since initial reports associating late stent thrombosis and restenosis with delayed hypersensitivity and neoatherosclerosis among first-generation DES [8, 13-16], development of newer DES that effectively suppress neointimal hyperplasia yet enhance biocompatibility, promote vessel healing, and restore vasomotor function after percutaneous coronary intervention has become an increasing focus. In particular, long after dissipation of anti-proliferative drug, the persistence of selected durable polymer coatings has been associated with incomplete endothelialization, expansive vessel remodelling, neoatherosclerosis, and delayed arterial healing associated with chronic inflammation [15-19].

However, concerns have been raised with regard to the safety of DES, especially in the acute myocardial infarction (AMI) setting. Although there are cautions for routine DES use in AMI, there is already widespread use of DES for AMI treatment in daily practice. Most early DES trials did not include patients undergoing primary PCI because of their relatively lower incidence of restenosis than other patient groups and slightly

Table 3: Cumulative Major Adverse Cardiac Events at 1 and 6-Months Follow-Up

	Non-AMI (*n* = 291 patients)	AMI (*n* = 239 patients)	*p*-Value
1-Month Follow-up			
Death, n (%)	6 (2.1%)	4 (1.7%)	1.00
Cardiac Death, n (%)	5 (1.7%)	4 (1.7%)	1.00
Non-cardiac Death, n (%)	1 (0.3%)	0 (0%)	1.00
Myocardial Infarction, n (%)	0 (0)	1 (0.4%)	0.45
TLR, n (%)	0 (0)	0 (0)	-
TVR, n (%)	0 (0)	0 (0)	-
Stent Thrombosis, n (%)	0 (0)	0 (0)	-
MACE	5 (1.7%)	5 (2.1%)	0.76
6-Months Follow-up			
Death, n (%)	7 (2.4%)	9 (3.8%)	0.45
Cardiac Death, n (%)	6 (2.1%)	8 (3.3%)	0.42
Non-cardiac Death, n (%)	1 (0.3%)	1 (0.4%)	1.00
Myocardial Infarction, n (%)	0 (0)	2 (0.8%)	0.20
TLR, n (%)	0 (0)	0 (0)	-
TVR, n (%)	0 (0)	0 (0)	-
Stent Thrombosis, n (%)	0 (0)	0 (0)	-
MACE	6 (2.1%)	10 (4.2%)	0.20

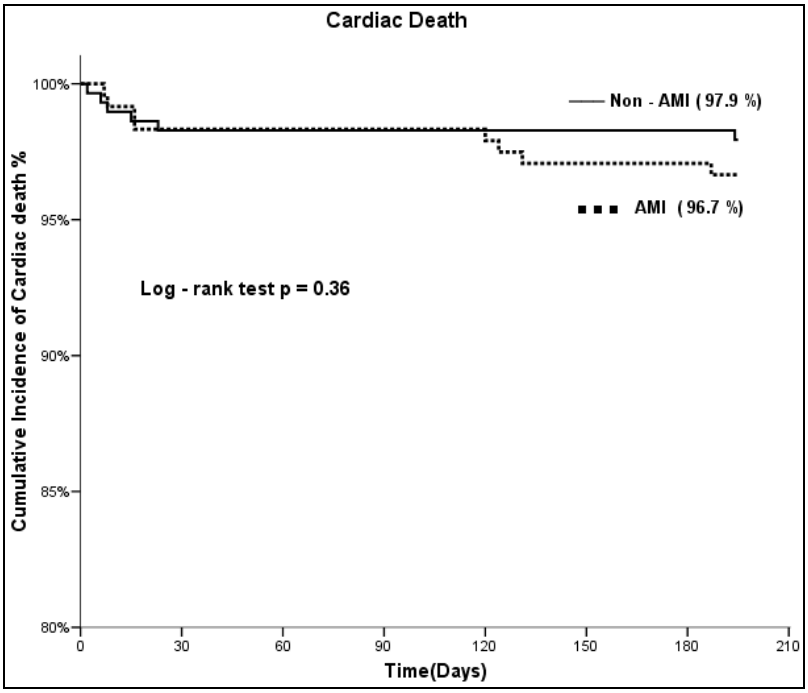

Figure 1: Event-free survival curves for cardiac death during 6-months follow-up.

higher thrombosis risk than with BMS. However, the TYPHOON trial showed that the use of the sirolimus-eluting stent (SES) was safe and reduced the rate of restenosis at 1-year [20]. The Paclitaxel-eluting stent versus conventional stent in ST-segment elevation myocardial infarction (PASSION) trial also showed a relatively reduced incidence of adverse cardiac events as compared with BMS [21]. However, limited data are

available on the safety and efficacy the biodegradable polymer coated DES in AMI patients.

In the present study patients were enrolled from daily clinical practice without specific inclusion and exclusion criteria. The current study does not show a marked increase in worse outcomes in AMI patients who received Indolimus® SES compared to non-AMI populations over a 6-months observation period. Several meta-analyses and randomized trials with head-to-head comparisons between DES and BMS for AMI have already been reported in the early DES era [22-25]. These reports similarly showed no significant differences in endpoints such as death and recurrent MI. The long term follow-up is ongoing to confirm additional safety in AMI patients.

CONCLUSIONS

In this all-comer, real-world Indolimus AMI study, MACE rates did not differ between AMI and non-AMI population. 6-months observation of AMI treatment using Indolimus® stent compared with non-AMI has no clinical disadvantage. Indolimus® SES can be used safely, but long-term clinical follow-up is needed to clarify this in AMI patients.

STUDY LIMITATIONS

First, the present study is limited by the fact that it is a single arm, nonrandomized study. Second, the study was designed with consecutive patient enrollment, but the registered population included only patients who received at least one Indolimus® SES. Therefore, the enrolled AMI population might be affected by selection bias. Third, details on the admission status, such as the presence of shock and infarct size, were not available. However, the main purpose of this study was to investigate midterm outcomes and the investigation was focused on safety concerns of patients with AMI when compared to non-AMI patients who do not have a life-threatening presentation.

DISCLOSURE

Dr. Ashok Thakkar is an employee of Sahajanand Medical Technologies Pvt. Ltd.

REFERENCES

[1] Stone GW, Ellis SG, Cox DA, *et al*. A polymer-based, paclitaxel-eluting stent in patients with coronary artery disease. N Engl J Med 2004; 350: 221-31. http://dx.doi.org/10.1056/NEJMoa032441

[2] Kastrati A, Mehilli J, Pache J, *et al*. Analysis of 14 trials comparing sirolimus-eluting stents with bare-metal stents. N Engl J Med 2007; 356: 1030-9. http://dx.doi.org/10.1056/NEJMoa067484

[3] Lagerqvist B, James SK, Stenestrand U, Lindback J, Nilsson T, Wallentin L. Long-term outcomes with drug-eluting stents versus bare-metal stents in Sweden. N Engl J Med 2007; 356: 1009-19. http://dx.doi.org/10.1056/NEJMoa067722

[4] Daemen J, Wenaweser P, Tsuchida K, *et al*. Early and late coronary stent thrombosis of sirolimus-eluting and paclitaxel-eluting stents in routine clinical practice. Lancet 2007; 369: 667-78. http://dx.doi.org/10.1016/S0140-6736(07)60314-6

[5] Kotani J, Awata M, Nanto S, *et al*. Incomplete neointimal coverage of sirolimus-eluting stents. Angioscopic findings. J Am Coll Cardiol 2006; 47: 2108-11. http://dx.doi.org/10.1016/j.jacc.2005.11.092

[6] Joner M, Nakazawa G, Finn AV, *et al*. Endothelial cell recovery between comparator polymer-based drug-eluting stents. J Am Coll Cardiol 2008; 52: 333-42. http://dx.doi.org/10.1016/j.jacc.2008.04.030

[7] Holmes DR Jr, Kereiakes DJ, Garg S, *et al*. Stent thrombosis. J Am Coll Cardiol 2010; 56: 1357-65. http://dx.doi.org/10.1016/j.jacc.2010.07.016

[8] Cook S, Ladich E, Nakazawa G, *et al*. Correlation of intravascular ultrasound findings with histopathological analysis of thrombus aspirates in patients with very late drug-eluting stent thrombosis. Circulation 2009; 120: 391-9. http://dx.doi.org/10.1161/CIRCULATIONAHA.109.854398

[9] Nakazawa G, Finn AV, Joner M, *et al*. Delayed arterial healing and increased late stent thrombosis at culprit sites after drug-eluting stent placement for acute myocardial infarction patients: an autopsy study. Circulation 2008; 118: 1138-45. http://dx.doi.org/10.1161/CIRCULATIONAHA.107.762047

[10] Finn AV, Nakazawa G, Kolodgie F, Virmani R. Drug eluting or bare metal stent for acute myocardial infarction: an issue of safety? Eur Heart J 2009; 30:1828-30. http://dx.doi.org/10.1093/eurheartj/ehp237

[11] Nakazawa G. Stent thrombosis of drug eluting stent: pathological perspective. J Cardiol 2011; 58: 84-91. http://dx.doi.org/10.1016/j.jjcc.2011.07.004

[12] Cutlip DE, Windecker S, Mehran R, *et al*. Clinical end points in coronary stent trials: a case for standardized definitions. Circulation 2007; 115: 2344-51. http://dx.doi.org/10.1161/CIRCULATIONAHA.106.685313

[13] Guagliumi G, Sirbu V, Musumeci G, *et al*. Examination of the *in vivo* mechanisms of late drug-eluting stent thrombosis. J Am Coll Cardiol Intv 2012; 5: 12-20. http://dx.doi.org/10.1016/j.jcin.2011.09.018

[14] Nakazawa G, Otsuka F, Nakano M, *et al*. The pathology of neoatherosclerosis in human coronary implants: bare-metal and drug-eluting stents. J Am Coll Cardiol 2011; 57: 1314-22. http://dx.doi.org/10.1016/j.jacc.2011.01.011

[15] Virmani R, Guagliumi G, Farb A, *et al*. Localized hypersensitivity and late coronary thrombosis secondary to a sirolimus-eluting stent: should we be cautious? Circulation 2004; 109: 701-5. http://dx.doi.org/10.1161/01.CIR.0000116202.41966.D4

[16] Nakazawa G, Finn AV, Vorpahl M, Ladich ER, Kolodgie FD, Virmani R. Coronary responses and differential mechanisms of late stent thrombosis attributed to first-generation sirolimus- and paclitaxel-eluting stents. J Am Coll Cardiol 2011; 57: 390-8. http://dx.doi.org/10.1016/j.jacc.2010.05.066

[17] Lüscher TF, Steffel J, Eberli FR, *et al*. Drug-eluting stent and coronary thrombosis: biological mechanisms and clinical implications. Circulation 2007; 115: 1051-8. http://dx.doi.org/10.1161/CIRCULATIONAHA.106.675934

[18] Finn AV, Nakazawa G, Joner M, *et al*. Vascular responses to drug eluting stents: importance of delayed healing. Arterioscler Thromb Vasc Biol 2007; 27:1500-10. http://dx.doi.org/10.1161/ATVBAHA.107.144220

[19] Joner M, Finn AV, Farb A, *et al*. Pathology of drug-eluting stents in humans: delayed healing and late thrombotic risk. J Am Coll Cardiol 2006; 48: 193-202. http://dx.doi.org/10.1016/j.jacc.2006.03.042

[20] Spaulding C, Henry P, Teiger E, *et al*. Sirolimus-eluting versus uncoated stents in acute myocardial infarction. N Engl J Med 2006; 355: 1093-104. http://dx.doi.org/10.1056/NEJMoa062006

[21] Laarman GJ, Suttorp MJ, Dirksen MT, *et al*. Paclitaxel-eluting versus uncoated stents in primary percutaneous coronary intervention. N Engl J Med 2006; 355: 1105-13. http://dx.doi.org/10.1056/NEJMoa062598

[22] Kastrati A, Dibra A, Spaulding C, *et al*. Meta-analysis of randomized trials on drug-eluting stents vs. bare-metal stents in patients with acute myocardial infarction. Eur Heart J 2007; 28: 2706-13. http://dx.doi.org/10.1093/eurheartj/ehm402

[23] Brar SS, Leon MB, Stone GW, *et al*. Use of drug-eluting stents in acute myocardial infarction: a systematic review and meta-analysis. J Am Coll Cardiol 2009; 53: 1677-89. http://dx.doi.org/10.1016/j.jacc.2009.03.013

[24] Mauri L, Silbaugh TS, Garg P, *et al*. Drug-eluting or bare-metal stents for acute myocardial infarction. N Engl J Med 2008; 359: 1330-42. http://dx.doi.org/10.1056/NEJMoa0801485

[25] Spaulding C, Teiger E, Commeau P, *et al*. Four-year follow-up of TYPHOON (trial to assess the use of the CYPHer sirolimus-eluting coronary stent in acute myocardial infarction treated with BallOON angioplasty). JACC Cardiovasc Interv 2011; 4: 14-23. http://dx.doi.org/10.1016/j.jcin.2010.10.007

Received on 02-12-2013 Accepted on 19-12-2013 Published on 31-12-2013

DOI: http://dx.doi.org/10.12970/2311-052X.2013.01.02.5