International Journal of the Cardiovascular Academy 2 (2016) 1–5

HOSTED BY

Contents lists available at ScienceDirect

International Journal of the Cardiovascular Academy

journal homepage: www.elsevier.com/locate/ijcac

Short communication

A comparison of drug-eluting stent versus balloon angioplasty in patients with bare-metal stent instent restenosis: 5 year outcomes☆

Abdulmelik Yıldız [a], Cennet Yıldız [b,*], Vecih Oduncu [a], Arif Oğuzhan Çimen [a]

[a] Medical Park Hospital, Istanbul, Turkey
[b] Tekden Hospital, Istanbul, Turkey

ARTICLE INFO

Article history:
Received 16 December 2015
Received in revised form 4 February 2016
Accepted 4 February 2016
Available online 3 March 2016

Keywords:
Bare metal stent
Drug eluting stent
Coronary revascularization
Saphenous vein graft

ABSTRACT

Objectives: The objective of the present study was to compare the long term outcomes of balloon angioplasty (BA) versus drug-eluting stents (DES) in bare-metal stent in-stent restenosis (BMS-ISR).
Background: Coronary in-stent restenosis (ISR) remains a significant clinical problem. Long term results after management of ISR may help improve treatment strategies.
Methods: We assessed 5-year clinical outcomes in cohort of 269 patients with BMS-ISR treated with DES (n = 154) and BA (n = 115) between June 2007 and January 2010 at our institution.
Results: Clinical and demographic characteristics were similar for both groups. Mehran classification was used to classify ISR lesions. BA were used predominantly in classes I and II, whereas classes III and IV were treated with DES ($p < 0.0001$). Percentages of major adverse cardiovascular events (MACE) including death, myocardial infarction (MI) and target vessel revascularization (TVR) for 4.37 ± 1.1 years were 50.4% and 31.8% for the BA and DES groups, respectively ($p = 0.002$). Although patients in the BA group had significantly higher rates of recurrent angina (42.6% vs. 27.3%, $p = 0.009$) and TVR (37.4% vs. 20.8%, $p = 0.003$), MI (6.1% vs. 5.2%, $p = 0.752$) and cardiac death (21.7% vs. 16.2%, $p = 0.251$) were similar in both groups. MACE-free 1-year survival and 5-year survival rates were significantly higher in DES group compared to BA group (1 year survival: 91.6% vs. 71.3 $p < 0.001$, and 5 year survival: 68.2% vs. 49.6%, $p < 0.0001$, respectively).
Conclusions: Although DES were more frequently used in to treat complicated lesions in patients with ISR, follow-up MACE rates were significantly lower and MACE-free survival was significantly better in the DES treated patients.

Introduction

Development of bare metal stents (BMS) has become a major advancement in the treatment of coronary artery disease. BMS reduce restenosis rates by attenuating arterial recoil and contraction as compared to balloon angioplasty. However, in-stent restenosis (ISR) still occurs in approximately 10–20% of cases.[1] Despite high rates of restenosis, BMS are widely used for treating coronary artery disease.[2] Treatment of ISR remains a major challenge for clinicians. There are many treatment options for patients having ISR like recurrent balloon angioplasty (BA), drug-eluting stents (DES) or BMS, cutting balloon angioplasty, directional coronary atherectomy, rotational coronary atherectomy and vascular brachytherapy.[3–6] Although vascular brachytherapy is an effective treatment of ISR, it requires additional personnel, training and equipment. BA may be preferred in patients with contraindications for dual antiplatelet therapy (DAPT). Weintraub et al. showed that restenosis that developed following successful BA has no adverse effect on long-term survival.[7]

In this study, we compared the long term results of new-generaton DES with those of BA in patients presenting with BMS-ISR.

Material and methods

Patients

We analyzed clinical and angiographic data of patients who underwent PCI in our institution between June 2007 and January 2010. A total of 398 patients developed BMS-ISR during the study period. Of the 398 patients, 88 had DES-ISR, 11 patients underwent coronary artery bypass graft surgery, 9 patients underwent hybrid coronary revascularization, 3 patients refused percutanous intervention, and 18 patients were lost to follow-up. The remaining 269 patients who were treated with balloon angioplasy or DES enrolled in the study. Patients

☆ Peer review under responsibility of The Society of Cardiovascular Academy.

* Corresponding author at: Konaklar mah. Org. İzzettin Aksalur cad. Oyak sitesi sok. 38, Blok Daire 2, Beşiktaş, İstanbul, Turkey. Tel.: +90 5337469996; fax: +90 2123698553.
E-mail addresses: drmelik@hotmail.com (A. Yıldız), cennet_yildiz@live.com (C. Yıldız), voduncu@yahoo.com (V. Oduncu), arif_cimen@yahoo.com (A.O. Çimen).
Peer review under responsibility of The Society of Cardiovascular Academy.

http://dx.doi.org/10.1016/j.ijcac.2016.02.003

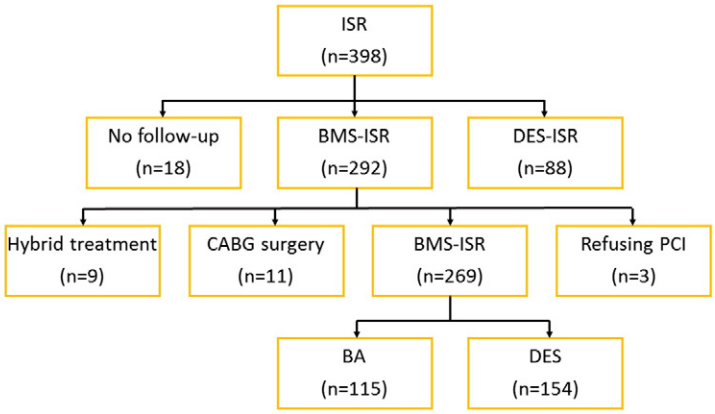

Fig. 1. Patient and treatment group profile. BMS ISR; bare metal in-stent restenosis, DES; drug eluting stent, DES ISR; drug eluting stent in-stent restenosis, ISR; instent restenosis.

were assigned to balloon angioplasty group (115 patients) or DES group (154 patients). Fig. 1 shows diagram of patients included and excluded in the study. Follow-up for all patients was continued until July 2013. The study was approved by the local ethics committee.

Clinical and laboratory evaluation

A medical history was taken from each patient, followed by a physical examination. Patient data were extracted from electronic medical records. The collected data included patient demographics, clinical characteristics, risk factors (arterial hypertension, diabetes mellitus, smoking, family history of coronary artery disease, dyslipidemia), medications, previous invasive cardiac procedures and echocardiographic findings including left ventricular ejection fraction (LVEF). Patients were excluded if they had active infection, anemia, renal failure, hepatic disease and thyroid function abnormalities. Patients received DAPT for four weeks after BMS implantation. Coronary angiography was performed to define coronary anatomy in patients who developed anginal symptoms, unstable angina, myocardial infarction (MI) and ischemic findings on nonivasive testing.

Coronary intervention

Coronary interventions were performed according to current practice guidelines and the results were recorded digitally for quantitative analysis. Degree of coronary stenosis was estimated visually by two experienced interventional cardiologists.

Definitions were based on predetermined criteria.

a- ISR was defined as >50% narrowing of the lumen diameter according to the results of follow-up coronary angiographies.
b- The Mehran and American College of Cardiology/American Heart Association classifications were used to assess lesion shape.[8] The classification is based on the length and pattern of the restenotic lesion in relation to the stented portion of the vessel. Four types of ISR have been defined: (I) focal (≤10 mm length); (II) diffuse (ISR > 10 mm within the stent); (III) proliferative (ISR > 10 mm extending outside the stent); and (IV) occlusive ISR.
c- Target vessel revascularization (TVR) was defined as repeat percutanous coronary intervention within the index procedure stent or 5 mm edge.[9–10]
d- All deaths were considered to be cardiac related unless a clear noncardiac cause could be established.
e- The diagnosis of MI required 2 of the following: 1) prolonged (>30 min) chest pain; 2) a rise in creatine kinase levels exceeding twice the local upper normal limit value (with abnormal MB fraction); and 3) development of persistent ischemic electrocardiographic changes (with or without new pathological Q waves).[11]
f- The Academic Research Consortium definition was used to assess the presence of stent thrombosis.[12]
g- Significant coronary stenosis was defined as 50% narrowing of the lumen diameter in major epicardial coronary vessels.[13]

All patients received clopidogrel (300 to 600 mg) at least 6 h before the stent implantation. They also received weight-adjusted intravenous heparin before the intervention. Procedural success was defined as reduction of stenosis to less than 10% residual narrowing, with improvement in ischemic symptoms and without major procedure related complications: death, emergency bypass surgery, or myocardial infarction (defined to be greater than twice the increase in creatine kinase-MB levels).[14]

Drug eluting sirolimus stent or drug eluting paclitaxel stent was used instent restenosis. Balloon size was selected in order to achieve a final balloon-to-artery ratio of 1.1/1. Relatively high pressures (>12 atm) were recommended.

The patients were premedicated with aspirin 100 mg/day, and were given clopidogrel (loading dose of 300 to 600 mg) at least 6 h before the intervention. The patients were advised to stay on clopidogrel for one year after stent implantation. All patients received optimal medical therapy.

The decision between BA and DES implantation as well as the choice between DES, BA or medical treatment in cases of recurrent restenosis were left to the operator. Patients in the DES group received DAPT for one year, whereas patients in the BA received aspirin only.

Intraobserver and interobserver variabilities of ISR analysis were assessed in a subset of 50 patients. Interpretations of the two investigators on the presence or absence of ISR agreed in 92% and 95% respectively. Intraobserver variability was assessed by one investigator. The concordance rate of the two readings for the presence or absence of ISR was 94% and 95% respectively.

Statistical analysis

Continuous variables are expressed as mean ± SD. Categorical variables are expressed as percentages. To compare parametric continuous variables, Student's t-test was used; to compare nonparametric continuous variables, the Mann Whitney U test was used; and to compare categorical variables, chi-squared test was used. Multivariate logistic regression analysis was carried out to identify the independent predictor of MACE. Event-free survival curves were generated by the