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Survival outcome in drug-eluting and bare-metal stents in a small study

Dewi Yanti Handayani[1], Herman Hariman[2], Stephen CL Koh[3*], Nizam Akbar[4]
[1-3] Department of Clinical Pathology and Faculty of Medicine, University of North Sumatera/Haj Adam Malik Hospital, Medan, Indonesia
[4] Department of Cardiology and Vascular Medicine, Faculty of Medicine, University of North Sumatera/Haj Adam Malik Hospital, Medan, Indonesia

Abstract
Background: Percutaneous coronary intervention with stent implantation is widely used for treatment of coronary artery disease preventing death or myocardial infarction over oral medication. However, it does not reduce the risk of deaths or myocardial infarctions or need of other interventions. Drug-eluting stents (DES) have an antiproliferative drug inhibiting excessive neointima growth and have lower rates of clinically indicated repeat revascularisation compared to bare-metal stents (BMS).
Objectives: To report the survival outcome in a small group of patients receiving the new-generation DES compared to BMS over a six-year period.
Methods: Fifteen patients of mean age 57.9 ± 9.3 years (range 44 to 71 years) with history of dizziness, unstable angina and myocardial infarction were recruited. However, all had stable angina pectoris at stent implantation except for two patients with either NSTEMI or STEMI. All patients received medications post-implantation, DES (n=9) and BMS (n=6). Cardiac biomarkers CKMB and Troponin T were also determined.
Results and Discussion: Lower rate of restenosis (>70% stenosis) was seen in DES (11.1%) than in BMS (50%). No restenosis was seen in 33.3% of DES compared to 100% in BMS at six years of study. Mortality at twelve months was 11.1% (DES) and 16.7% (BMS) and by 64 months it was 33.3% (DES) and 50% (BMS). The survival outcome at six years was 66.7% (DES) and 50% (BMS).
Conclusion: This small study favours the benefits derived from DES in having less restenosis occurrences in long-term implantation and lower mortality rates than seen in patients with BMS.

Keywords: PCI, stents and survival outcome

1. Introduction

Percutaneous coronary intervention (PCI), is a non-surgical procedure in treating the narrowing (stenosis) of the coronary arteries in coronary artery disease. Stents are used to restore the arterial blood flow. PCI are used in urgent acute myocardial infarction, unstable angina and is an alternative to coronary artery bypass grafting (CABG) [1]. PCI includes the insertion of stents, bare-metal or drug-eluting stents preventing death or myocardial infarction over oral medication in stable coronary artery disease [2, 3, 4]. However, it does not reduce the risk of deaths, myocardial infarctions or need for other interventions [2]. Elevated CK-MB and Troponin T levels may occur in 30% of all PCI procedures and are associated with higher risk of death, subsequent myocardial infarction or the need for repeat revascularisation [5, 6].

Traditional bare-metal stents (BMS) with mechanical framework holds the artery open preventing stenosis. The new generation drug-eluting stents (DES) (everolimus-eluting stents) with polymer containing drugs that prevent cell proliferation have dramatically reduced concerns about late stent thrombosis [7]. PCI with implantation of DES or BMS has been a frequently performed therapeutic procedures in medicine and in the prevention of re-stenosis [8]; its uses are more effective and may also reduce the rate of stent thrombosis [9, 10]. The rate of outcome of death from any cause and non-fatal myocardial infarction at 6 years was 16.6% in DES and 17.1% in BMS and the rate of stenosis were low in both groups, 0.8% in DES and 1.2% in BMS [11]. The unadjusted death rate for one-year survival was reported as 3.8% and 5.0% for DES and BMS respectively and the recurrence of unstable angina were lower in DES [12]. The rate of repeat revascularization was lower in DES and the rates of stent-thrombosis were low in both groups. (P=0.05) [11, 13, 14], however, the relative risk of stent thrombosis remains uncertain [15]. Observational data from large registries suggest survival benefit of PCI in coronary heart disease [16, 17] but meta-analysis of observational and randomized studies yielded conflicting results [18, 19]. No significant differences were seen in long-term survival of follow-up of 4.6 years with initial strategy of optimal medical therapy and PCI compared with optimal medical therapy alone was reported [20].

The objective is to report the survival outcome in an extension study of a post-graduate research in a small group of Indonesian patients receiving drug-eluting and bare-metal stents over a 6-year period,

2. Materials and Methods

The study received ethical approval from the Health Research Ethical Committee (No:303/KOMET/FK USU/2012), Faculty of Medicine, University of North Sumatera, Indonesia. The study was conducted at the Department of Clinical Pathology and the Department of Cardiology and Vascular Medicine, Haji Adam Malik Hospital in Medan, Indonesia.

Subjects. This study forms part of an extension study of the

post-graduate research in a small group of patients. The patients were recruited from the Department of Cardiology and Vascular Medicine after giving written Informed Consent to take part in the study. Percutaneous Coronary Intervention (PCI) was performed when 70% of coronary blockage was detected. The Inclusion Criteria; above 40 years old, had clinical history of dizziness, unstable angina, myocardial infarction, non-ST Elevation Myocardial Infarction (NSTEMI) or STEMI. The Exclusion Criteria; below 40 years old, none-of the above clinical findings or not keen to take part in the study. The 15 patients (males n=14; female n=1) from a consecutive sampling to receive the new generation drug-eluting stents (DES n=9) when medical insurance are available or bare-metal stents (BMS n=6) when the patients paid for the cost of stents. The recruitment for the study were completed within October 2012. All patients had stable angina pectoris at PCI.

Management. All patients received medications of aspirin 100 mg, clopidogrel 15 mg and simvastatin 20 mg once a day for 18 months and thereafter continue aspirin 100 mg daily.

Laboratory investigation. Plain blood and serum collected from patients before PCI was used to determine cardiac biomarkers CKMB (Architect Abbott, IL, USA); normal rang 0 to 24 U/L and Troponin T (RAMP Troponin T, Response Biomedical, BC, Canada), normal range; negative or below 0.4 µg/L.

Statistical analysis. The Statistical Package for Social Sciences (SPSS 22 IBM Corp) was used to perform descriptive analysis.

3. Results

3.1 Patients' characteristics in receiving either the new-generation DES or BMS

The mean age of the patients (males n=14, female n=1) was 57.9 ± 9.3 years and ranged between 44 years and 71 years old. All the patients had stable angina pectoris except one each for non-ST Elevation Myocardial Infarction (NSTEMI) (DES) and STEMI (BMS) at the time of stent implantation. CKMB biomarker are all within normal limits (<24 U/L) in 13 patients except one at 36 U/L who is diabetic and a smoker and another (smoker) with 391 U/L and Troponin T of greater than 2 µg/L, otherwise Troponin T was negative in all other patients. Twelve patients (80%) were smokers, hypertension n=8 (53.5%), diabetes mellitus n=5 (33.3%). After 6 years from insertion of stents 4 patients (DES n=1, BMS n=3)) had greater than 70% stenosis and all are waiting for re-stenting. All three remaining patients with BMS had greater than 70% stenosis. Three patients (DES) had stenosis of between 30% and 50% and the remaining 3 patients (33.3%) (DES) had no history of stenosis during this period. Six patients died (DES n=3 [33.3%], BMS n= 3 [50%]) and survival outcome was 66.7% (DES) and 50% (BMS) at 6 years after stent implants (Table 1).

Table 1: Patients' characteristics in receiving the new-generation drug-eluting (DES) and bare-metal (BMS) stents.

	DES	**BMS**
N	**9**	**6**
Sex: male/female	9/0	5/1
Age: mean 57.9 ± 9.3 years; range 44 — 71		
CKMB: mean 17.4 ± 6.7 U/L, range 8-36 U/L	9	5*
Troponin T: negative (<0.4gg/L,)	9	5**
Stable Angina Pectoris _a		5
NSTEMU STEME	1	1
Smoker	7	5
Hypertension	7	1
Diabetes Mellitus	4	1
Re-stenosis (>70% stenosis) at 6 years	1(11.1%)	3 (50%)
Re-stenosis 30% to 50% at 6 years	3(33.3%)	0
No- stenosis at 6 years	(33.3%)	0
Died at 6 years	3(33 3%)	3 (50%)
Survival outcome at 6 years	6(66.7%)	3 (50%)

* excluded (BMS) 391 U/L (n=1); ** >2.0 µg/L (n=1)

3.2 Mortality and survival outcome in DES and BMS in 6 years of study

Mortality in the first 12 months after stent implant was 13.3% (n=2), DES 11.1%; BMS 16.7%. The DES patient had congestive heart failure at 1-month and the BMS patient had elevated CKMB level of 391 U/L, Troponin T >2.0 µg/L died at 8 months. By 36 months mortality was DES n=2 (22.2%), BMS n=2 (33.3%) and by 64 months DES n=3 (33.3%) and BMS n=3 (50%), Figure 1.

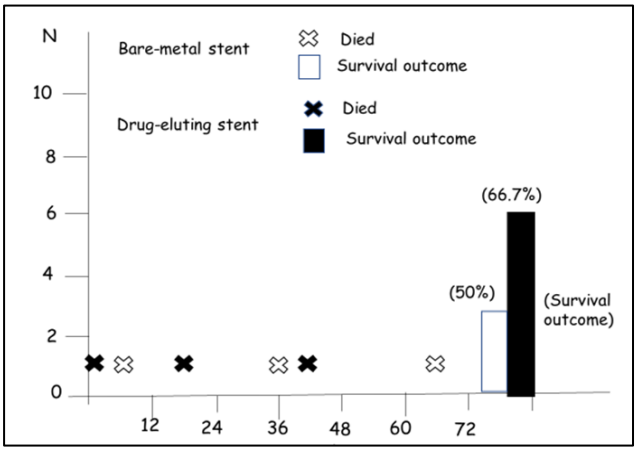

Fig 1: Mortality and survival-outcome in DES and BMS in 6 years of study

4. Discussion

Percutaneous coronary intervention with stent implantation is widely used for the treatment of coronary artery disease. The development of BMS was a major advance relative to balloon angioplasty in the management of coronary artery disease. DES have an antiproliferative drug that inhibits excessive neointima growth thus reducing the high rate of restenosis and the new-generation DES was reported to have lower rates of clinically indicated repeat revascularisation compared to BMS [10, 14, 21].

In our small study, lower rate of restenosis (>70% stenosis) was seen in DES (11.1%, n=1) than in BMS (50%, n=3) whilst three DES patients had stenosis between 30% and 50%. No stenosis was seen in the other three DES patients (33.3%) whilst re-stenosis (>70% stenosis) p was seen in the remaining three BMS patients (100 %) at 6 years of study. The mortality rate also favours DES patients (33.3%) compared to BMS (50%) at 6 years of study which was much higher than reported in a recent study of 16.6% (DES) and 17.1% (BMS) with low stenosis rate of 0.8% (DES) and 1.2% (BMS) [11]. Mortality in the first 12 months in our study was 11.1% (DES) and 16,7% (BMS) which was also much higher when compared to 3.8% (DES) and 5.0% (BMS) in an Indian study (12). By 36 months mortality was DES (22.2%) and BMS (33.3%) and by 64 months it was 33.3% (DES) and 50% (BMS). The survival rate at 6 years post-implantation was 66.7% in DES and 50% in BMS.

The above findings from our small study favours the benefits derived from DES than BMS in having less restenosis occurrences in long-term implantation and the lower mortality rate from DES agreed with earlier reports [11, 13, 14] and observational studies [16, 17]. A much larger study group is needed to confirm these findings seen in Indonesian cohorts. The higher mortality and restenosis rate could be due to some of the patients' complacency in default of management therapy which was not properly determined.

5. Conclusion

This small study favours the benefits derived from DES in having less restenosis occurrences in long-term implantation and lower mortality rates than seen in patients with BMS

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Conflict of Interest: The authors declared that they have no conflict of interest.

7. References

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