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ARTYKUŁ ORYGINALNY / *ORIGINAL ARTICLE*

The impact of multiple stent implantation in the infarct-related artery on one-year clinical outcomes of patients with ST-elevation myocardial infarction undergoing primary percutaneous coronary intervention. Data from the Polish NRDES Registry

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Abstract

Background and aim: We sought to evaluate the impact of multiple stent implantation in the infarct-related artery (IRA) on one-year clinical outcomes of patients with ST-segment elevation myocardial infarction (STEMI) undergoing primary percutaneous coronary intervention (PCI).

Methods and results: Data on 1741 consecutive patients with STEMI, who underwent immediate PCI with implantation of ≥ 1 stent, enrolled the National Registry of Drug Eluting Stents (NRDES) were assessed. Patients were stratified based on the number of implanted stents in IRA: 1 vs. ≥ 2 stents. At the discretion of operators, ≥ 2 stents in IRA were implanted in 247 (14.2%) patients. The remaining 1494 patients were treated with a single stent. Patients treated with multiple stents were less likely to achieve Thrombolysis In Myocardial Infarction (TIMI) grade 3 flow after primary PCI. Overall mortality at one year was 8.3% in the single stent group and 10.3% in the ≥ 2 stents group ($p = 0.37$; adjusted for propensity score $p = 0.13$). After propensity score matching, patients treated with ≥ 2 stents were at higher risk of definite or probable stent thrombosis and urgent revascularisation at one year.

Conclusions: In patients with STEMI undergoing primary PCI, a need for implantation of ≥ 2 stents in IRA carries an increased risk of stent thrombosis and urgent revascularisation at one year.

Key words: primary angioplasty, drug-eluting stent, bare-metal stent, ST elevation myocardial infarction

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INTRODUCTION

Coronary stent implantation during primary percutaneous coronary intervention (PCI) reduces recurrent ischaemia and the risk of target-vessel revascularisation (TVR) as compared to balloon angioplasty alone [1]. When anatomically and technically feasible, primary PCI with stent implantation is the recommended method of reperfusion in patients with ST-segment elevation myocardial infarction (STEMI) [2]. Introduction of drug-eluting stents (DES) has contributed substantially to the reduction of the risk for TVR as compared

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to the use of bare-metal stents (BMS) [3, 4]. Although even using new-generation DES, primary PCI with stent implantation in patients with acute coronary syndromes (ACS) carries an increased risk of stent thrombosis [3–8]. Observed risk of stent thrombosis is higher in patients requiring more complex revascularisation (longer stents, multiple stents) [6–9]. Confirmation of the impact of the number of stents implanted/total stent length on clinical outcomes (especially stent thrombosis) was drawn from large-scale registries including patients undergoing stent implantation for both ACS and non-ACS [6–8]. Previous studies have not addressed this issue specifically for patients undergoing primary PCI for STEMI. Also, there is a limited amount of data on the impact of the number of stents implanted on other clinical outcomes in that group of patients. Thus, we sought to evaluate the impact of the implantation of multiple stents in the infarct-related artery (IRA) on one-year clinical outcomes of unselected patients with STEMI undergoing primary PCI using data from the National Registry of Drug Eluting Stents (NRDES) [10–12].

METHODS

Patient population

A detailed description of the NRDES registry design and the main results have been previously published [10–12]. Consecutive patients with acute myocardial infarction (STEMI or non-STEMI), who underwent immediate PCI in 13 high-volume interventional cardiology centres in Poland from October 2010 till October 2011 were enrolled in the registry. For the present analysis, data on 1741 (64.8%) registry patients with STEMI, who underwent immediate PCI with implantation of ≥ 1 stent within native coronary artery lesions or bypass grafts were assessed. Patients were stratified based on the number of implanted stents in IRA: 1 stent vs. ≥ 2 stents. The treatment strategies, including the number and the length of implanted stents, were at the discretion of the operator. The NRDES registry complied with the Declaration of Helsinki and was approved by the Bioethics Committee at the Jagiellonian University in Krakow, Poland (KBET/120/B/2010 on September 30, 2010).

Endpoints

The primary endpoint of this analysis was one-year all-cause mortality. Secondary clinical endpoints included: non-fatal reinfarction, definite or probable stent thrombosis as defined by the Academic Research Consortium [13], urgent revascularisation (PCI and/or coronary artery bypass graft [CABG]), and TVR at one-year follow-up. One-year follow-up was gathered mainly by telephone. In the case of rehospitalisation, patients and/or treating centres were asked to provide hospitalisation-related documents.

Statistical analysis

Data were analysed according to the established statistical standards. Results are presented as numbers of patients (percentages) or mean ± standard deviation as applicable. Differences in categorical variables were analysed using the χ^2 test or Fisher exact test, as appropriate. Continuous variables were compared using unpaired t-test. All statistical analyses were performed using JMP software (version 9.0.0; SAS Institute, Cary, NC, USA).

Due to the observational character of the study the statistical analysis plan included a step of balancing for covariates. Balancing was performed for STEMI patients with implantation of 1 stent vs. ≥ 2 stents during index primary PCI. A one-to-one matched procedure without replacement was performed. We modelled the log odds of probability of implantation of ≥ 2 stents as a function of selected confounders depending on the subpopulation. Each patient with ≥ 2 stents implanted was matched with patient with 1 stent implanted, with propensity score matching within a given threshold. If more than one subject with 1 stent implanted was found then the procedure picked one of these at random. If no subjects with 1 stent implanted were found, a subject with ≥ 2 stents implanted was dropped from further analysis as a mismatch. The confounders list that was balanced consisted of: age, gender, previous myocardial infarction, arterial hypertension, hyperlipidaemia, diabetes mellitus, chronic kidney disease, previous stroke, previous PCI, previous CABG, Killip class on admission, arterial access site, number of coronary arteries with significant narrowing, IRA — left main coronary artery (LMCA), left anterior descending artery (LAD), diagonal branch (Dg), intermediate branch (IM), circumflex artery (Cx), marginal branch (Mg), right coronary artery (RCA), saphenous vein graft (SvG), arterial graft; Thrombolysis In Myocardial Infarction (TIMI) flow before PCI, glycoprotein IIb/IIIa inhibitors during PCI, TIMI thrombus grade [14], thrombectomy, and stent type. We modified experimentally the propensity similarity threshold and confounders list, which were included in the propensity score matching to obtain satisfactory balancing, i.e. standardised differences for all variables were estimated at below 10%. Matched pairs were analysed by paired t-tests to assess whether differences in occurrence rates of overall death in one-year follow-up between subjects with 1 stent vs. ≥ 2 stents implanted were statistically significant or not. Estimated risk differences and 95% confidence intervals for these differences were calculated. Additionally, to confirm that effect of the number of implanted stents in IRA was independent of the total stent length, logistic regression analysis was conducted. Results were then corrected for IRA (LMCA or LAD or Dg vs. other), TIMI before PCI (≤ 1 vs. other), and stent type (DES vs. BMS) — Model 1, and the same factors plus age, gender, access site (femoral vs. other), presence of diabetes mellitus, previous stroke, previous myocardial infarction, previous PCI, previous CABG, Killip class on admission ≤ 2, and chronic kidney disease — Model 2. Groups were compared using odds ratio with 95% confidence intervals, indicating that the odds of implantation of multiple stents rather than

the use of a single stent increases (if > 1) the risk of death at one-year follow-up. All presented p values are two-sided and are considered as statistically significant if < 0.05.

RESULTS

Baseline characteristics

In the NRDES registry database, we identified 1741 patients with STEMI treated with ≥ 1 stent during primary PCI. At the discretion of operators, ≥ 2 stents in IRA were implanted in 247 (14.2%) patients. The remaining 1494 patients were treated with a single stent (85.8%). As shown in Table 1, patients treated with ≥ 2 stents were older, with higher prevalence of multi-vessel coronary artery disease, and they presented in a higher Killip class on admission to the primary-PCI centre. The RCA was identified as IRA more frequently in patients with ≥ 2 stents implanted as compared to patients treated with a single stent. A trend towards more frequent use of aspiration thrombectomy in patients receiving a single stent was observed. Despite no difference in TIMI flow at baseline, patients treated with multiple stents were less likely to achieve complete epicardial flow (TIMI grade 3 flow) after primary PCI. The mean total stent length in IRA was 19.6 ± 6.5 mm

Table 1. Baseline characteristics and invasive treatment details according to number of implanted stents

Variable	1 stent in IRA (n = 1494)	≥ 2 stents in IRA (n = 247)	P
Age [years]	63.8 ± 12.2	66.5 ± 11.6	0.0012
Men	1043 (69.8%)	157 (63.6%)	0.05
Previous myocardial infarction	213 (14.3%)	36 (14.6%)	0.92
Arterial hypertension	1026 (68.7%)	175 (70.9%)	0.55
Hyperlipidaemia	847 (56.7%)	150 (60.7%)	0.24
Diabetes mellitus	250 (16.7%)	50 (20.2%)	0.17
Chronic kidney disease	42 (2.8%)	9 (3.6%)	0.42
Previous stroke	53 (3.6%)	12 (4.9%)	0.36
Previous PCI	116 (7.8%)	17 (6.9%)	0.70
Previous CABG	22 (1.5%)	5 (2.0%)	0.57
Killip class on admission:			0.0092
I	1378 (92.2%)	213 (86.2%)	
II	44 (3.0%)	11 (4.5%)	
III	12 (0.8%)	2 (0.8%)	
IV	60 (4.0%)	21 (8.5%)	
Access site:			0.14
Femoral	1308 (87.5%)	227 (91.9%)	
Radial	185 (12.4%)	20 (8.1%)	
Brachial	1 (0.1%)	0 (0%)	
Number of coronary arteries with significant narrowing:			< 0.0001
1-vessel disease	801 (53.6%)	93 (37.7%)	
2-vessel disease	458 (30.7%)	86 (34.8%)	
3-vessel disease	211 (14.1%)	61 (24.7%)	
LMCA and RCA disease	10 (0.7%)	3 (1.2%)	
LMCA disease	14 (0.9%)	4 (1.6%)	
Infarct-related artery:			
LMCA	32 (2.1%)	7 (2.8%)	0.49
LAD	647 (43.3%)	93 (37.7%)	0.11
Dg	116 (7.8%)	18 (7.3%)	0.90
IM	10 (0.7%)	2 (0.8%)	0.68
Cx	192 (12.9%)	33 (13.4%)	0.84
Mg	75 (5.0%)	13 (5.3%)	0.88
RCA	593 (39.7%)	127 (51.4%)	0.0006
SvG	7 (0.5%)	3 (1.2%)	0.16
Arterial graft	0 (0%)	1 (0.4%)	0.14

→

Table 1. (cont.) Baseline characteristics and invasive treatment details according to number of implanted stents

Variable	1 stent in IRA (n = 1494)	≥ 2 stents in IRA (n = 247)	P
TIMI flow before PCI:			0.26
0	951 (63.7%)	161 (65.2%)	
1	144 (9.6%)	31 (12.6%)	
2	131 (8.8%)	21 (8.5%)	
3	268 (17.9%)	34 (13.8%)	
Thrombus grade:			0.43
0–1	670 (44.9%)	122 (49.4%)	
2	279 (18.7%)	45 (18.2%)	
3	139 (9.3%)	26 (10.5%)	
4	135 (9.0%)	16 (6.5%)	
5	271 (18.1%)	38 (15.4%)	
Glycoprotein IIb/IIIa inhibitors during PCI:			0.60
Abciximab	280 (18.7%)	38 (15.4%)	
Tirofiban	1 (0.1%)	0 (0%)	
Eptifibatide	92 (6.2%)	17 (6.9%)	
None	1121 (75.0%)	192 (77.7%)	
Aspiration thrombectomy	498 (33.3%)	66 (26.7%)	0.10
Number of stents in IRA:			< 0.0001
1	1494 (100%)	0 (0%)	
2	0 (0%)	223 (90.3%)	
3	0 (0%)	22 (8.9%)	
4	0 (0%)	2 (0.8%)	
Stent(s) length in IRA:			
> 20 mm	490 (32.8%)	244 (98.8%)	< 0.0001
≤ 20 mm	1004 (67.2%)	3 (1.2%)	
> 25 mm	259 (17.3%)	232 (93.9%)	< 0.0001
≤ 25 mm	1235 (82.7%)	15 (6.1%)	
> 30 mm	88 (5.9%)	198 (80.2%)	< 0.0001
≤ 30 mm	1405 (94.1%)	49 (19.8%)	
Stent type:			0.0009
Drug-eluting stent	448 (33.2%)	53 (22.7%)	
Bare-metal stent	998 (66.8%)	191 (77.3%)	
TIMI flow after PCI:			< 0.0001
≤ 2	63 (4.2%)	29 (11.7%)	
3	1431 (95.8%)	218 (88.3%)	
Non-IRA PCI	28 (1.9%)	5 (2.0%)	0.80

Values are presented as number of patients (percentage) or mean ± standard deviation; CABG — coronary artery bypass grafting; Cx — left circumflex coronary artery; Dg — diagonal branch; IM — intermediate branch; IRA — infarct-related artery; LAD — left anterior descending coronary artery; LMCA — left main coronary artery; Mg — marginal branch; PCI — percutaneous coronary intervention; RCA — right coronary artery; SvG — saphenous vein graft; TIMI — Thrombolysis In Myocardial Infarction

vs. 40.6 ± 11.8 for the 1 stent vs. ≥ 2 stent group, respectively ($p < 0.0001$). In the majority of patients unfractionated heparin and clopidogrel was used before and during primary PCI (bivalirudin in < 2% of patients and prasugrel in < 1% of patients with no difference between groups).

Outcomes

One-year follow-up data were available for 85% of patients (with no difference between study groups). Unadjusted and adjusted by propensity score matching primary and secondary endpoints are provided in Table 2. A need for implantation

Table 2. Primary and secondary endpoints at one-year follow-up (unadjusted and adjusted by propensity score)

Variable	Unadjusted results			Adjusted results				
	1 stent in IRA	≥ 2 stents in IRA	P	1 stent in IRA	≥ 2 stents in IRA	Risk difference (95% CI)	P	Pairs no.
Death	8.3%	10.3%	0.37	15.9%	10.2%	5.7% (–1.7%; 13.1%)	0.13	157
Stent thrombosis	0.9%	2.4%	0.22	0%	4.0%	–4.0% (–8.0%; –0.1%)	0.0449	99
TVR	1.3%	1.8%	0.63	0%	3.0%	–3.0% (–6.5%; 0.4%)	0.08	99
Reinfarction	3.9%	7.3%	0.0411	2.1%	8.3%	–6.2% (–12.6%; 0.2%)	0.06	97
Urgent PCI	6.0%	8.4%	0.29	2.0%	8.2%	–6.1% (–12.4%; 0.2%)	0.06	98
Urgent CABG	1.3%	2.5%	0.36	1.1%	2.1%	–1.1% (–3.1%; 1.0%)	0.32	95
Urgent PCI or CABG	7.2%	22.1%	0.13	2.1%	10.6%	–8.5% (–15.0%; –2.0%)	0.0106	94

Values are presented as percentages of patients; CABG — coronary artery bypass grafting; CI — confidence interval; IRA — infarct-related artery; PCI — percutaneous coronary intervention; TVR — target-vessel revascularisation

Table 3. Primary and secondary endpoints at one-year follow-up according to the number of stents and the total stent length (unadjusted and adjusted)

	Unadjusted[a]		Adjusted (Model 1)[b]		Adjusted (Model 2)[c]	
	Odds ratio (95% CI)	P	Odds ratio (95% CI)	P	Odds ratio (95% CI)	P
Death						
Number of stents in IRA (1 vs. ≥ 2)	0.80 (0.38–1.60)	0.53	0.51 (0.23–1.10)	0.10	0.50 (0.21–1.15)	0.11
Stent(s) length in IRA (per 5 mm)	0.90 (0.80–1.01)	0.07	0.84 (0.74–0.95)	0.0044	0.88 (0.77–1.01)	0.06
Stent thrombosis						
Number of stents in IRA (1 vs. ≥ 2)	12.62 (1.92–76.19)	0.0094	11.11 (1.59–72.07)	0.0123	11.71 (1.61–85.25)	0.0139
Stent(s) length in IRA (per 5 mm)	1.54 (1.03–2.50)	0.0346	1.53 (1.01–2.53)	0.07	1.57 (1.03–2.65)	0.06
TVR						
Number of stents in IRA (1 vs. ≥ 2)	0.69 (0.09–3.93)	0.69	0.55 (0.06–3.35)	0.55	0.61 (0.07–3.97)	0.63
Stent(s) length in IRA (per 5 mm)	0.85 (0.66–1.15)	0.28	0.83 (0.63–1.12)	0.20	0.83 (0.61–1.15)	0.24
Reinfarction						
Number of stents in IRA (1 vs. ≥ 2)	8.66 (2.97–24.90)	0.0001	9.73 (3.26–28.61)	0.0001	7.80 (2.53–23.89)	0.0003
Stent(s) length in IRA (per 5 mm)	1.39 (1.11–1.79)	0.0031	1.43 (1.13–1.85)	0.0042	1.36 (1.08–1.76)	0.0138
Urgent PCI						
Number of stents in IRA (1 vs. ≥ 2)	3.22 (1.32–7.65)	0.0111	3.18 (1.28–7.64)	0.0106	3.26 (1.29–8.00)	0.0108
Stent(s) length in IRA (per 5 mm)	1.23 (1.04–1.48)	0.0147	1.24 (1.04–1.50)	0.0186	1.23 (1.03–1.48)	0.0242
Urgent CABG						
Number of stents in IRA (1 vs. ≥ 2)	0.66 (0.10–3.34)	0.63	0.50 (0.07–2.80)	0.47	0.33 (0.04–2.07)	0.26
Stent(s) length in IRA (per 5 mm)	0.79 (0.63–1.03)	0.08	0.77 (0.60–1.01)	0.0480	0.67 (0.48–0.94)	0.0186
Urgent PCI or CABG						
Number of stents in IRA (1 vs. ≥ 2)	2.28 (1.02–4.94)	0.0440	2.14 (0.94–4.73)	0.06	2.13 (0.92–4.79)	0.07
Stent(s) length in IRA (per 5 mm)	1.09 (0.95–1.27)	0.23	1.09 (0.94–1.27)	0.27	1.07 (0.93–1.26)	0.36

[a]Model 0 — number of stents in IRA (1 vs. ≥ 2), stent(s) length in IRA
[b]Model 1 — number of stents in IRA (1 vs. ≥ 2), stent(s) length in IRA, IRA (LMCA or LAD or Dg vs. other), TIMI before PCI ≤ 1, stent type (DES vs. BMS)
[c]Model 2 — number of stents in IRA (1 vs. ≥ 2), stent(s) length in IRA, IRA (LMCA or LAD or Dg vs. other), TIMI before PCI ≤ 1, stent type (DES vs. BMS), age, gender, access site, diabetes mellitus, previous stroke, previous myocardial infarction, previous PCI, previous CABG, Killip class on admission ≤ 2, chronic kidney disease
BMS — bare-metal stent; CABG — coronary artery bypass grafting; CI — confidence interval; DES — drug-eluting stent; Dg — diagonal branch; IRA — infarct-related artery; LAD — left anterior descending coronary artery; LMCA — left main coronary artery; PCI — percutaneous coronary intervention; TIMI — Thrombolysis In Myocardial Infarction; TVR — target-vessel revascularisation

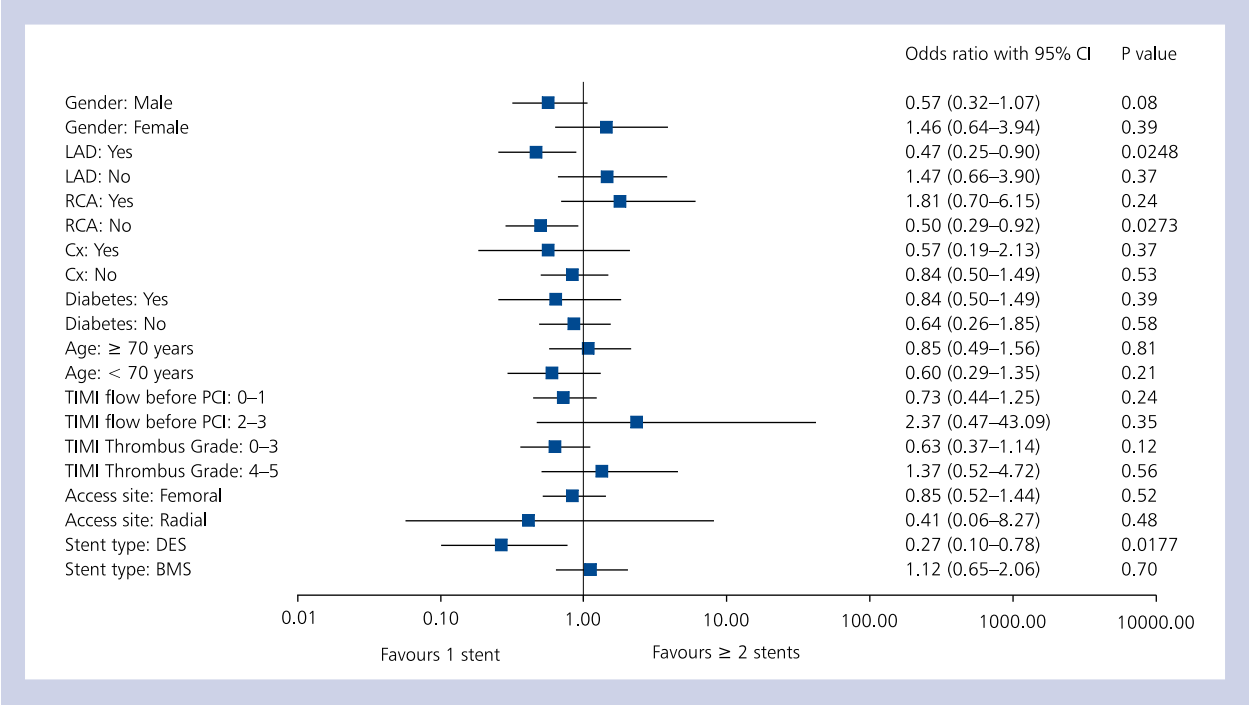

Figure 1. Subgroup analyses for one-year all-cause mortality according to number of implanted stents. Values are presented as unadjusted odds ratios with 95% confidence interval (CI); BMS — bare-metal stent; Cx — left circumflex coronary artery; DES — drug-eluting stent; LAD — left anterior descending coronary artery; RCA — right coronary artery; TIMI — Thrombolysis In Myocardial Infarction

of ≥ 2 stents in IRA was associated with increased risk of stent thrombosis and urgent revascularisation (PCI or CABG) during one-year follow-up. No difference in all-cause mortality was observed between groups (Table 2). Logistic regression analysis revealed that association between implantation of ≥ 2 stents in IRA and increased risk of stent thrombosis was independent of the total stent length and baseline clinical characteristics (Table 3). Specific subgroup analyses revealed that there was no impact of multiple stents implantation on one-year all-cause mortality, except for lower mortality in patients with the LAD occlusion/stenosis treated with a single stent as compared to a treatment with ≥ 2 stents (Fig. 1). Also, the one-year mortality was lower for patients treated with a single DES as compared to patients treated with ≥ 2 DES. In contrast, no difference was observed between patients treated with a single vs. multiple BMS.

DISCUSSION

The main finding of the present study is that, in patients with STEMI undergoing primary PCI, a need for implantation of ≥ 2 stents in IRA carries an increased risk of stent thrombosis and urgent revascularisation at one year. However, it does not affect one-year mortality.

One in seven patients in the NRDES registry required implantation of ≥ 2 stents in IRA during primary PCI for STEMI. The implantation of multiple stents may be prompted by excessive target lesion length, incomplete lesion coverage, and/or endoluminal injury requiring additional stent scaffolding beyond the margins of the initial stent deployed. Furthermore, multiple overlapping stents may be required to repair coronary dissections [15]. Also, the implantation of ≥ 2 stents may be needed for the treatment of multiple lesions within IRA. Importantly, in line with previous reports, implantation of ≥ 2 stents was associated with increased risk of stent thrombosis [6, 8]. A higher number of implanted stents/longer total stent length itself poses a risk of thrombotic complications after stent implantation. It may be more pronounced in patients with overlap implantation of multiple stents, as compared to patients without stents overlap [16]. On the other hand, in the registries, a need of implantation of ≥ 2 stents may be interpreted as a marker of disease severity and a more complex coronary anatomy. In our study, multiple stent implantation was required in older patients with multi-vessel disease, as well as haemodynamically unstable patients. Importantly, haemodynamic instability (cardiogenic shock) itself is associated with increased risk of stent thrombosis [6, 8]. However, the difference in the risk for stent thrombosis between patients treated with 1 stent vs. ≥ 2 stents persisted even after correction for potential confounding factors and risk profile.

Interestingly, a trend towards more frequent use of aspiration thrombectomy in patients receiving a single stent as compared to patients treated with multiple stents was observed. Restoration of the patency of IRA with aspiration catheters allows better visualisation of the distal part of the vessel, and selection of more appropriate size/length of stent [17]. In addition, thrombectomy reduces the thrombus burden. Importantly, thrombus presence, especially large thrombus presence influences the risk of stent thrombosis in patients with STEMI undergoing DES implantation during primary PCI [18]. However, the observed difference in the risk of stent thrombosis between patients treated with 1 stent vs. ≥ 2 stents was not influenced by the thrombus burden.

In previous studies, the implantation of multiple BMS was associated with a higher risk of restenosis and TVR [15, 19]. The mechanism by which multiple stents are associated with restenosis is unknown; one explanation may be related to overlapping of the stents, which may provoke a greater degree of neointimal proliferation; alternatively, the increased length of the stented segment may also evoke a greater degree of proliferation [19]. Due to the potent suppression of neointimal hyperplasia afforded by DES, the risk of restenosis after DES implantation is less dependent on the number of implanted stents/total stent length [15]. However, a need of implantation of multiple overlapping DES, even new generation DES, itself poses a risk for TVR at long-term follow-up [15, 16, 20]. In the NRDES registry only a trend toward an increased risk of TVR in patients treated with ≥ 2 stents as compared to patients treated with a single stent was observed. However, the overall rate of TVR was very low, as the risk of ischaemic TVR in patients after STEMI is frequently lower than in patients without infarction because the infracted territory may be clinically silent when restenosis occurs. The observed difference in the need for urgent revascularisation was probably related to the difference in the presence of multi-vessel disease between the groups.

Future studies should evaluate the impact of multiple stent implantations in patients treated with new stents designs (i.e. mesh covered stents, self-expandable stents), specifically for lesions with a large thrombus burden [21]. Due to growing interest in bioresorbable vascular scaffold implantation in patients with ACS, it is also necessary to assess the impact of multiple bioresorbable vascular scaffolds implantation during primary PCI on long-term clinical outcomes of patients with STEMI [22, 23]. In addition, new $P2Y_{12}$ inhibitors (prasugrel, ticagrelor) are more effective in preventing stent thrombosis in patients treated with stent during primary PCI for STEMI [24]. The need for implantation of ≥ 2 stents in IRA during primary PCI may identify the subgroup of patients with a higher risk of ischaemic complications and possibly higher benefit from prolonged and more aggressive antiplatelet treatment with prasugrel or ticagrelor instead of clopidogrel. However, this appealing concept requires confirmation in other studies.

Limitations of the study

Our study has several limitations. The main limitation of the study was its non-randomised design and the potential of selection bias. Even using propensity score adjustment, we were unable to control all patients, operator and centre-related factors influencing the association between the number of implanted stents and patients' outcomes. Unfortunately, important data on the indication for implantation of another stent (i.e. dissection, not completed lesion coverage, treatment of long segments) were not available. Also, data on the spatial relationship of multiple stents (overlapping vs. separate stents) were not collected. Angiographic data were not validated by an independent core lab and were based on operators' visual assessment during PCI. In addition, one-year outcome data were available only for 85% of patients enrolled in the NRDES registry. The incidence of in-stent restenosis may be overestimated due to the lack of routine angiographic follow-up. Important data on discharge medications and long-term compliance of antiplatelet agents were not available. Thus, the study results, especially the sub-group analysis results, should be considered exploratory and hypothesis-generating.

CONCLUSIONS

In patients with STEMI undergoing primary PCI, a need for implantation of ≥ 2 stents in IRA carries an increased risk of stent thrombosis and urgent revascularisation at one year.

Impact on daily practice

The need of implantation of ≥ 2 stents in the IRA during primary PCI for acute myocardial infarction may identify the subgroup of patients with a higher risk of ischaemic complications, especially stent thrombosis at long-term follow-up. In such a group of patients, we can expect greater benefit from prolonged and more aggressive antiplatelet treatment with prasugrel or ticagrelor instead of clopidogrel. However, this appealing concept requires confirmation in other studies.

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Wpływ implantacji wielu stentów w zakresie tętnicy odpowiedzialnej za zawał na jednoroczne rokowanie kliniczne pacjentów z zawałem serca z uniesieniem odcinka ST poddawanych zabiegowi angioplastyki wieńcowej. Dane z rejestru NRDES

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Streszczenie

Wstęp i cel: Celem pracy była ocena wpływu implantacji wielu stentów w zakresie tętnicy odpowiedzialnej za zawał (IRA) na rokowanie roczne pacjentów z zawałem serca z uniesieniem odcinka ST (STEMI) poddawanych zabiegowi pierwotnej przezskórnej interwencji wieńcowej (PCI).

Metody i wyniki: Oceniono dane dotyczące 1741 kolejnych pacjentów z STEMI poddawanych natychmiastowej PCI z implantacją ≥ 1 stentu włączonych do rejestru National Registry of Drug Eluting Stents (NRDES). Biorąc pod uwagę liczbę implantowanych stentów w obrębie IRA, chorych podzielono na dwie grupy — 1 vs. ≥ 2 stenty. Na podstawie decyzji operatora ≥ 2 stenty w obrębie IRA implantowano u 247 (14,2%) osób. Pozostałych 1494 pacjentów leczono z użyciem 1 stentu. Pacjenci leczeni wieloma stentami rzadziej osiągali przepływ *Thrombolysis In Myocardial Infarction* (TIMI) 3 po zabiegu PCI. Łączna roczna śmiertelność wyniosła 8,3% w grupie z 1 stentem i 10,3% w grupie z ≥ 2 stentami (p = 0,37; skorygowana przy użyciu skali skłonności: p = 0,13). Po zastosowaniu dopasowania przy użyciu skali skłonności (*propensity score matching*) pacjenci leczeni ≥ 2 stentami charakteryzowali się wyższym ryzykiem wystąpienia pewnej i prawdopodobnej zakrzepicy w stencie i pilnej rewaskularyzacji w okresie roku.

Wnioski: U chorych z STEMI poddawanych PCI konieczność implantacji ≥ 2 stentów w IRA wiąże się ze zwiększonym ryzykiem zakrzepicy w stencie i pilną rewaskularyzacą w okresie roku.

Słowo kluczowe: pierwotna angioplastyka, stenty pokrywane, stenty metalowe, zawał serca

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