International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

IJMRP

Original Research Article

A Retrospective Study on Multi-Vessel Stenting During Primary Percutaneous Coronary Intervention for Acute Myocardial Infarction in a Tertiary Care Teaching Hospital

G R Kane[1], Sanjay Desai[2*]

[1]HOD Cardiology, [2*]Resident, Department of Cardiology,
D Y Patil School of Medicine, Nerul, Navi Mumbai, Maharashtra, India.

ABSTRACT

Background: Recanalization of the offender injury is the fundamental objective of essential angioplasty for intense ST-fragment height myocardial dead tissue (STEMI). Patients giving intense myocardial localized necrosis and multi-vessel infection are, in this way, as a rule subjected to organized methodology, with the essential percutaneous coronary intervention (PCI) bound to recanalization of the infarct-related artery (IRA). Hypothetically in any event, early alleviation of stenosis of non-infarct-related corridors could advance insurance dissemination, which could confine the infarct measure. Be that as it may, the wellbeing and achievability of such an approach has not been enough settled.

Methods: In this single-center prospective study we examined 36 consecutive patients who had an acute STEMI and at least one or more lesions≥70% in a major epicardial vessel other than the infarct related artery. In the first 14 patients, forming the multi-vessel (MV) PCI group, all lesions were treated during the primary procedure. In the following 22 patients, forming the culprit-only (CO) PCI group, only the culprit lesion was treated during the initial procedure, followed by either planned-staged or ischemia-driven revascularization of the non-culprit lesions.

Results: The two groups were well balanced in terms of clinical characteristics, number of diseased vessels and angiographic characteristics of the culprit lesion. In the MV-PCI group, 2.51 lesions per patient were treated using 2.96 ± 1.34 stents (1.00 lesions and 1.76 ± 1.17 stents in the CO-PCI group, both $p < 0.001$).

Conclusion: We may state from this constrained experience that a multi-vessel stenting approach for patients with intense STEMI and multi-vessel ailment is achievable and likely safe amid routine clinical practice. Our information recommends that this approach may constrain the infarct measure. Be that as it may, bigger reviews, maybe utilizing drug-eluting stents, are as yet expected to additionally assess the wellbeing and proficiency of this technique, and whether it is related with a lower need of consequent revascularization and lower costs.

Key words: Stents, Multi-Vessel Disease, Acute Infarction.

***Correspondence to:**

Dr. Sanjay Desai,
Resident, Department of Cardiology,
D Y Patil School of Medicine,
Nerul, Navi Mumbai, Maharashtra, India.

Article History:

Received: 17-10-2016, **Revised:** 04-11-2016, **Accepted:** 28-11-2016

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2016.2.6.059	

INTRODUCTION

Infarct size is a vital determinant of forecast in patients with intense myocardial localized necrosis.[1] Early reperfusion of the infarct-related artery (IRA) is undoubtedly the most important intervention to limit the infarct size.[2] Primary stent implantation of the IRA has proven to be the reperfusion modality of choice.[3] Extra elements that may add to confinement of infarct size in relationship with reperfusion incorporate help of coronary fit, avoidance of harm of microvasculature, enhanced systemic hemodynamics and advancement of guarantee dissemination.

The magnitude of coronary collateral flow is indeed one of the principal determinants of infarct size.[4] Some collaterals are seen in nearly 40% of patients with an acute total occlusion and more begin to appear soon after total occlusion occurs.[5] The nearness of pledges is typically connected with high-review stenoses and multi-vessel coronary corridor sickness. However, and according to the recommendations of current guidelines, staged procedures are usually performed in the presence of multi-vessel disease, with the primary procedure being limited to recanalization of the IRA, except for patients presenting with cardiogenic shock.[6,7] It seems reasonable to investigate an alternative strategy, based on rapid relief of all significant lesions in the non- IRA besides recanalizing the IRA when dealing with multi-vessel disease patients, as an effort to promote collateral circulation and further limit the infarct size. The aim of this study was to evaluate the safety and feasibility of such an approach in an everyday clinical setting.

METHODS

Design and Population

This is a single-center, prospective observational study carried out in the dept. of Cardiology, D Y Patil School of Medicine, Nerul, Navi Mumbai, Maharashtra (India) to determine the safety and feasibility of multi-vessel stenting during primary percutaneous coronary intervention (PCI). In the study period of 1 year duration, 36 consecutive patients presenting with an acute ST-segment elevation myo-cardial infarction (STEMI) on the basis of inclusion and exclusion criteria.

Procedures

Patients were treated according to the standard care of treatment for patients with acute STEMI. A qualifying coronary angiography including a left ventriculography in RAO 308 and LAO 508 was performed. After inclusion, the activated clotting time (ACT) was measured and an intra-arterial heparin bolus was given to maintain the ACT≥300 s or ≥250 s in case of glycoprotein (GP) IIb/IIIa receptor antagonists' administration. ACT was repeated every 30 min until procedure end. The use of GP inhibitors was strongly recommended (to be in line with current guidelines), but was left to the operator's discretion. A loading clopidogrel dose of 300 mg was given as soon as possible after inclusion and continued as a daily dose of 75 mg for at least 4 weeks. A 500 mg IV aspirin dose was given before PCI and continued indefinitely at a daily oral dose of 100 mg.

Both groups were treated with bare metal stents. The IRA was always treated first, then the non-IRAs. Direct stenting was always attempted in the non-IRAs. Only the culprit lesion in the IRA was treated during the initial procedure. The decision for further staged intervention with or without objective evidence of ischemia was left to the treating physician.

Angiographic success was defined as in-stent residual stenosis ≤ 20% with TIMI 3 flow for both the infarct-related as well as the non-infarct-related arteries. Fluoroscopy time and contrast amount were recorded for both groups.

Follow-Up and Endpoints

Patients received medications according to current guidelines, including aspirin and clopidogrel as previously described, a statin, a beta-blocker and an angiotensin converting enzyme inhibitor. Total CK, CK-MB and Troponin T were measured on admission, every 6 h in the first 24 h, then serially until normalization. Thirty-day major adverse cardiac events (MACE), defined as death, myocardial re-in-farction and/or target vessel revascularization (TVR), were recorded. Re-infarction was defined as recurrent chest pain associated with new ischemic electrocardiographic changes or re-elevation of se-rum cardiac markers. TVR included repeat PCI or bypass surgery. Cerebrovascular accidents, defined as any neurologic event considered representing a hemorrhagic or nonhemorrhagic stroke, bleeding requiring surgery and/or blood transfusion, and all other complications requiring a specific intervention or leading to prolonged hospitalization were also recorded. Patients were then followed up for one year for further occurrence of MACE as well as for the need for any revascularization (in both target and non-target vessels).

Statistical Analysis

All data analyses were performed with the Statistical Package for Social Sciences (SPSS for Windows 13.0, SPSS Inc.) software.

Table 1: Baseline clinical and angiographic characteristics of the study patient

Variable	MV-PCI (n = 14)	Culprit-only PCI (n = 22)
Age in years	61 ± 12	67 ± 13
Male gender, n (%)	10	17
Diabetes mellitus, n (%)	1	3
Hypertension, n (%)	10	18
Dyslipidemia, n (%)	11	17
Current smoking, n (%)	5	9
Anterior infarction, n (%)	8	6
Inferior infarction, n (%)	6	17
Cardiogenic shock, n (%)	1 (3.6)	1
Left ventricular ejection fraction (%)	42 ± 11	47 ± 11
2-vessel disease, n (%)	5	12
3-vessel disease, n (%)	8	11
TYPE OF LESION IN INFARCT ARTERY		
A/B1, n (%)	8	9
B2/C, n (%)	6	13

MV-PCI Multi-vessel PC

RESULTS

Study population

Clinical and procedural characteristics of the study groups are shown in Tables 1 and 2. The two groups were similar regarding age, sex, cardiovascular risk factors, left ventricular ejection fraction, number of diseased vessels, lesion type, use of GP antagonists and angiographic success.

Significantly more patients with inferior wall infarction and fewer patients with anterior wall infarction were treated in the CO-PCI group. A similar low rate of cardiogenic shock was observed in both groups. In the MV-PCI group, 2.51 lesions per patient were treated using 2.96 ± 1.34 stents (1.00 lesions and 1.76 ± 1.17 stents in the CO-PCI group, both $p < 0.001$).

The median fluoroscopy time increased from 10.3 (7.2–16.9) min in the CO-PCI group to 12.5 (8.5–19.3) min in the MV-PCI group (p = 0.22), and the amount of contrast used from 200 (180–250) ml in the CO-PCI group to 250 (200–300) ml in the MV-PCI group (p = 0.16).

In-hospital and 30-day outcome

Peak CK and CK-MB levels were significantly lower in patients of the MV-PCI group (843 ± 845 and 135 ± 125 vs 1652 ± 1550 and 207 ± 155 U/l, p < 0.001 and 0.01, respectively). Follow-up data at 30 days are shown in Table 3. There were no significant differences between both study groups in the rates of death, re-infarction or TVR after 30 days. Combined MACE rates were similar (10.7% for the MV-PCI group and 9.1% for the CO-PCI group, p = 0.82). Two cases of subacute stent thrombosis were seen in the MV-PCI group; both occurred in the non-IRAs. Both led to a recurrent infarction and were treated by recurrent PCI. In the CO-PCI group, a single case of subacute stent thrombosis was recorded (p = 0.56).

One-year outcome

One-year follow-up was completed for 12 of the 14 patients of the MV-PCI group, and for 21 of the 22 patients of the CO-PCI group (follow-up rates of 89% and 96%, respectively).

Table 2: Procedural characteristics of the study patients

Variable	MV-PCI (n = 14)	Culprit-only PCI (n = 22)
Number of vessels treated, mean	2.17	1
Number of lesions treated, mean	2.51	1
Number of stents used per patient, mean ± SD	2.96 ± 1.3	1.76 ± 1.17
Use of glycoprotein IIb/IIIa inhibitors, n (%)	5	10
Angiographic success in infarct artery, n (%)	13	19
Angiographic success in non-infarct artery, n (%)	13	-
Fluoroscopy time in minutes, median (IQR)	12.5 (8.5–19.3)	10.3 (7.2–16.9)
Contrast dye amount in ml, median (IQR)	250 (200–300)	200 (180–250)

MV-PCI Multi-vessel PCI, IQR Interquartile range

Table 3: Follow-up data at 30 days

Variable	MV-PCI (n = 14)	Culprit-only PCI (n = 22)
Death, n (%)	1 (3.6)	2 (4.5)
Recurrent infarction, n (%)	2 (7.1)	2 (4.5)
Target vessel revascularization, n (%)	2 (7.1)	2 (4.5)
Stent thrombosis, n (%)	2 (7.1)	1 (2.3)
Cerebrovascular accidents, n (%)	1 (3.6)	1 (2.3)
Bleeding requiring transfusion and/or surgery, n (%)	1 (3.6)	2 (4.5)
Combined MACE, n (%)	3 (10.7)	4 (9.1)

MV-PCI Multi-vessel PCI, MACE Major adverse cardiac events

MACE was defined as death, recurrent infarction or target vessel revascularization

Table 4: Cumulative follow-up data at one year

Variable	MV-PCI (n = 14)	Culprit-only PCI (n = 22)
Death, n (%)	2	1
Recurrent infarction, n (%)	1	2
Target vessel revascularization, n (%)	3	5
Combined MACE, n (%)	3	6
Non-TVR, n (%)	2	2
Total revascularizations, n (%)	3	6

MV-PCI Multi-vessel PCI, MACE Major adverse cardiac events, TVR Target vessel revascularization. MACE was defined as death, recurrent infarction or target vessel revascularization no significant differences between both groups in the cumulative rates of death, recurrent infarction and TVR (Table 4). The cumulative rates of MACE were 24% for the MV-PCI group and 28% for the CO-PCI group (p = 0.73).

The incidence of any revascularization (in both target and non-target vessels) was also similar in both groups (24% and 28%, respectively, p = 0.73).

DISCUSSION

The sign for PCI has moved towards intense coronary disorders, as exhibited by rising rates of mediations for intense myocardial dead tissue during the most recent decade.[8] Half of the patients giving intense STEMI have multivessel coronary supply route malady on angiography and 60–90% of patients with cardiogenic stun have multi-vessel ailment or left fundamental ailment.[9] Current practice usually confines intervention during the primary procedure to the IRA with a deferred approach to the other non-infarct vessels if needed. Beside reperfusion of the IRA, enhancement of collateral flow could help limit the infarct size, a major prognostic factor in patients with acute myocardial infarction.

Immediate relief of flow-obstructing stenosis in non-IRAs during the primary procedure could, therefore, be of prognostic value.

Both short- and long-term outcome following multi-vessel intervention in the setting of acute myocardial infarction remain controversial, with only a very limited number of studies analyzing this strategy.[10-12] In a large retrospective study, Corpuset al. showed that multi-vessel PCI during the primary procedure was an independent predictor of MACE at long term mainly due to its high rate of TVR and re-infarction.[10] Furthermore, an increased risk of stent thrombosis was feared in patients with acute myocardial infarction subjected to multi-vessel stenting during the primary procedure. However, on the other hand, in a small randomized controlled trial, using modern, less thrombogenic stents, in conjunction with more effective antiplatelet drugs, complete revascularization with multi-vessel treatment during primary PCI appeared to be safer, without a significantly higher risk for in-hospital events.[11] Moreover, the high TVR rates associated with multi-vessel stent treatment have been substantially reduced with the introduction of the sirolimus eluting stent when treating stable coronary artery disease patients.[13]

We in this manner trusted it was sensible to reinvestigate this approach of finish revascularization in patients with intense STEMI and noteworthy multivessel ailment amid the essential stage for a beneficial outcome on restricting the infarct measure by utilizing present day medicate eluting stents. In any case, such an approach would include a few challenges; consequently, we felt that the principal basic stride was to assess its achievability and security utilizing an exposed metal stent. We used a third-generation stent system having good mechanical properties[14] to facilitate the procedure and followed up the patients for one year. We stented only lesions ≥ 70% after intracoronary administration of nitroglycerin in the non-IRAs in order to avoid stenting of functionally non-significant lesions.

As expected, both radiation time and contrast amount were higher in the group treated with multivessel stenting. However, the difference between the groups did not reach statistical significance, probably because of the small sample size. Nevertheless, the multi-vessel stenting approach seems feasible from a logistic point of view.

MACE rates at 30 days were similar in both groups (10.7% in the MV-PCI group and 9.1% in the CO-PCI group). These rates are less than those reported by Roe et al. [10], but more than those reported by Di Mario et al.[11] In the MV-PCI group, two cases of subacute stent thrombosis were seen and both occurred in the non-IRAs, which could be a matter of concern. On revising the acute angio-graphic results of both cases, a type A dissection at the distal landing zone was identified in one case, and the implanted stent appeared to be oversized causing a distal step-down in the other case. Both cases had a recurrent infarction, were subjected to repeat PCI, and completed their follow-up. The single death case that occurred in the MV-PCI group during initial hospitalization was in a 72-year-old male patient with anterolateral wall infarction who presented with cardiogenic shock. Recanalization of the infarct-related artery (LCX) was followed by revascularization of the LAD and RCA in the same setting. The patient died one week later after initial hemodynamic stabilization.

Interestingly, and despite the significantly higher incidence of anterior wall infarctions in the MV-PCI group, peak CK and CK-MB levels were significantly lower, which may reflect a smaller infarct size in the group where complete revascularization was attempted during the initial procedure. This finding has to be interpreted cautiously, since objective evaluation of the final infarct size using echocardiography, nuclear imaging or delayed enhancement cardiac magnetic resonance (CMR) imaging has not been performed. Nevertheless, a recent small study by Hedström et al.[15] demonstrated a strong correlation between peak values of CK-MB and infarct size as estimated by delayed enhancement CMR, suggesting that these peak values can be used to estimate infarct size after primary PCI.

Cumulative MACE rates at one year were also similar in both groups (24% in MV-PCI group and 28% in the CO-PCI group). These rates are also comparable to those recorded by Roe et al. in multi-vessel and culprit-only PCI patients[12] and to the MACE rates of the culprit-only group in the study reported by Corpus et al.[10] Again, with the significantly higher incidence of anterior wall infarctions in the MV-PCI group, one might have expected a worse outcome in this group of patients

Regarding the use of drug-eluting stents in this complex interventional setting, a recently published meta-analysis of six trials comparing drug-eluting with bare metal stents in acute infarction demonstrated what drug-eluting stents are well known to do, that is, reduce the need for repeat revascularization procedures.[16] However, with the level of uncertainty currently surrounding these devices,[17] long-term follow-up data for a larger number of patients are needed to confirm the safety of drug-eluting stents in this context.

CONCLUSION

We can finish up from this restricted experience that a multi-vessel stenting approach for patients with STEMI and multi-vessel sickness is plausible and most likely safe amid routine clinical practice. Our information recommend that this approach may help restrain the infarct measure. We imagine that the following intelligent stride is to start a substantial randomized trial, maybe utilizing drug-eluting stents, to additionally assess the security of this strategy and whether it is related with a lower need of resulting revascularization and lower costs.

REFERENCES

1. Califf RM, Bengtson JR. Cardiogenic shock. N Engl J Med 1994;330:1724–1730

2. Maroko PR, Braunwald E. Modification of myocardial infarct size after coronary occlusion. Ann Intern Med 1973;79:720–733

3. Grines CL, Cox DA, Stone GW et al. Coronary angioplasty with or without stent implantation for acute myocardial infarction. Stent

Primary Angioplasty in Myocardial Infarction Group. N Engl J Med 1999;341:1949
4. De Wood MA, Spores J, Notske RN et al. Prevalence of total coronary artery occlusion during the early hours of transmural myocardial infarction. N Engl J Med 1980; 303:897–902
5. Martin GV, Kennedy JW. (1994) Choice of thrombolytic agent. In: Julian D, Braunwald E (eds) Management of Acute Myocardial Infarction. WB Saunders, London, pp 71–105
6. Silber S, Albertsson P, Avilés FF et al. Guidelines for percutaneous coronary interventions. The Task Force for Percutaneous Coronary Interventions of the European Society of Cardiology. Eur Heart J 2005; 26:804–847
7. Smith SC Jr, Feldman TE, Hirshfeld JW Jr et al: ACC/AHA/SCAI 2005 guide- line update for percutaneous coronary intervention: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/SCAI Writing Committee to Update the 2001 Guidelines for Percutaneous Coronary Intervention). American College of Cardiology Web Site. Available at: http://www.acc.org/clinical/guidelines/percutaneous/update/index_rev.pdf
8. Cook S, Walker A, Hügli O et al. Percutaneous coronary interventions in Europe. Prevalence, numerical estimates, and projections based on data up to 2004. Clin Res Cardiol 2007; 96:375–382
9. Lane GE, Holmes DR. (2003) The modern strategy for cardiogenic shock. In: Cannon CP (ed) Management of Acute Coronary Syndromes. Humana Press, Totowa, NJ, pp 603–652
10. Corpus RA, House JA, Marso SP et al. Multivessel percutaneous intervention in patients with multivessel disease and acute myocardial infarction. Am Heart J 2004; 148 (3):493–500
11. Di Mario C, Sansa M, Airoldi F et al. Single versus multivessel treatment during primary angioplasty: results of the multicentre randomized HEpacoat TM for culprit or multivessel stenting for Acute Myocardial Infarction (HELP AMI) Study. Int J Cardiovasc Intervent 2004; 6:128–133
12. Roe MT, Cura FA, Joski PS et al. Initial experience with multivessel percutaneous coronary intervention during mechanical reperfusion for acute myocardial infarction. Am J Cardiol 2001; 88:170–173
13. Serruys PW, Ong ATL, Morice MC et al. Arterial revascularization therapies part II – Sirolimus-Eluting Stents for the treatment of patients with multivessel de novo coronary artery lesions. Euro Interv 2005; 2:147–156
14. Kaiser C, Brunner-La Rocca HP, Buser PT et al. Incremental cost- effectiveness of drug-eluting stents compared with a third generation bare-metal stent in a real world setting: randomized Basel Stent Kosten Effektivitäts Trial (BASKET). Lancet 2005; 366:921–992
15. Hedström E, Astrom-Olsson K, Ohlin H et al. Peak CKMB and cTnT accurately estimates myocardial infarct size after reperfusion. Scand Cardiovasc J 2007; 41:44–50
16. Pasceri V, Patti G, Speciale G et al. Meta-analysis of clinical trials on use of drug eluting stents for treatment of acute myocardial infarction. Am Heart J 2007;153:749–754
17. Carlsson J, von Wagenheim B, Linder R et al. Is late stent thrombosis in drug-eluting stents a real clinical issue? A single-center experience and review of the literature. Clin Res Cardiol 2007; 96:86–93.

Source of Support: Nil. **Conflict of Interest:** None Declared.

Cite this article as: G R Kane, Sanjay Desai. A Retrospective Study on Multi-Vessel Stenting During Primary Percutaneous Coronary Intervention for Acute Myocardial Infarction in a Tertiary Care Teaching Hospital. Int J Med Res Prof. 2016; 2(6):289-93. DOI:10.21276/ijmrp.2016.2.6.059