

## Multi vessel Percutaneous Intervention : When and How

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Coronary artery disease is rising in epidemic proportions in India, occurring at an early age and with more severe disease as compared to western population. In this article we discuss the different approaches in managing multivessel disease with special emphasis on percutaneous intervention.

Coronary artery disease (CAD) in India is rising in epidemic proportions. Various studies from India have shown high prevalence of the disease, approaching approximately 11% in the urban population and 7% in the rural population across India.<sup>1</sup> The disease also strikes early in more young population compared to west.<sup>2</sup> The disease severity is also involving more number of vessels<sup>3</sup>. The diffuse disease pattern and early onset of multi vessel disease (MVD) in our country requires an approach different from what is just practiced as per ACC/AHA guidelines<sup>4</sup>. The more number of young individuals who unfortunately suffer MVD in our country should be given an opportunity to avoid Coronary Bypass grafting (CABG) surgery if possible as we know the Surgical grafts even in the best of hands would last roughly to a maximum of 10 years when a repeat surgery which will be more risky would be required in patient management. We recommend a slightly different approach in managing MVD in our country as explained in this article.

**Decision making protocol in MVD:** It is important for us to consider the total patient milieu of presentation with the disease rather than taking decision only on the number of the vessels involved. The type and extent of disease severity both the stenosis percentage and the nature – whether focal or diffuse nature of involvement of atherosclerotic process should also be considered important in making decisions regarding revascularization or medical management. Thus we recommend the following process guidelines in decision making basing on clinical presentation of the patient first followed by further analysis of revascularization depending on the coronary anatomy.

### Clinical presentation:

**MVD patient presenting with Acute Coronary Syndrome (ACS):** In India we have a higher Incidence of ACS compared to West<sup>5</sup>. In acute setting especially when the patient presents early within few hours of symptoms in STEMI or with ongoing pain in USA/NSTEMI, it is important to offer the benefit of immediate revascularization by PCI rather than wasting precious time in arranging for surgery irrespective of the disease pattern. The culprit vessel PCI should be done as soon as possible. The decision whether to revascularise other vessels in the same sitting or at a different time should be taken depending upon the lesion severity in the other vessels and also depending upon the way how the first culprit vessel revascularization process went and the final result obtained. If culprit vessel PCI was done smoothly without consuming too much effort, time and contrast and if the other vessel has critical stenosis with limitation of the flow – then only we recommend revascularization of other vessel PCI in same setting. Otherwise even with slightest of the doubt in the final result of the culprit vessel and if the other lesions are less severe but important (>70%) we should stage the procedure and do an elective pre discharge PCI for the other vessels. We also should plan for complete revascularization with the third generation Drug Eluting Stents (DES) in this sub set of patients who otherwise could have high follow up events and target lesion revascularization (TLR) requirement when done with BMS or earlier version of DES<sup>6</sup>. All these patients should be put on dual antiplatelet agents at least for one year unless there is a specific contraindication and also to be on high dose statin therapy with high intensity statin therapy<sup>7</sup>.

**MVD patient presenting as stable ischemic heart disease:** The decision making process in stable patients with MVD could be broadly as per the Syntax trial recommendations<sup>8</sup>. The left main & triple vessel disease patients (upper tertile of Syntax) can still be offered CABG while the lower two tertiles sub groups could be offered multi vessel PCI. The decision to do PCI of which vessel first should be based some clinical pointers like any subtle EKG changes either old or new indicating the more important lesion to be tackled first. In the

absence of any such subtle pointers we should tackle the difficult lesion first as we will have the option of CABG left to patient in case we fail to revascularise the difficult lesion like CTO. In the situation in a patient where complete revascularization is definitely possible, then the vessel which supplies the maximum area of myocardium which is mostly left anterior descending (LAD) should be revascularised first. If either right coronary artery(RCA) or left circumflex (LCX) has more critical disease which could cause ischemia while treating LAD we can fix up those lesions before we do LAD PCI. Out of the other two vessels, which ever has the tightest disease should be tackled before the other vessel. In case of borderline lesion severity it is always mandatory to do fractional flow reserve (FFR) to the vessel and do PCI only if the lesion comes significant on FFR. We observed that the proximal LAD lesions though looking less severe on angiography become important with FFR values of <0.80 due to large area of perfusion while the other vessels like RCA, LCx and other branch vessels like Diagonals and Obtuse marginal turn out insignificant on FFR with values of >0.80.

Thus we recommend liberal usage of FFR when in doubt in MV PCI decision making process. If any lesion has a suspicion of eccentricity with hazy appearance on angiography or has borderline FFR values in between 0.80 - 0.85 or else when there is a discrepancy between clinical presentation and angiographic lesion severity we also take help of Intracoronary imaging – (IVUS or OCT) depending upon the availability and the operators comfort with each type of technique. This is the indication for usage of intracoronary imaging apart from the routine usage of it during stenting to optimize the deployment. If a patient has Left Main bifurcation disease or more than one vessel Chronic total Occlusion(CTO), even today we feel CABG could be better choice to these patients unless there are any specific contraindications. The decision making process should involve “ Heart team “ approach where cardiac surgeon and other team members along with the treating cardiologists participates and takes decisions after proper counseling & involvement of patient and their family members.

**How to do? :** Most of the procedures are done through radial route using 6F guide catheters. The only exception to this broad rule could be while dealing with left main bifurcation technique or bifurcation PCI wherein electively two stent strategy is planned. Under such situations femoral route using 7 F guide catheters could be used. We pretreat all patients with adequate dual antiplatelet regimens and high dose statins as per the recommendations. We still use regular unfractionated heparin during the procedure maintaining activated clotting time (ACT) values around 250-300 secs. In some cases with history of

heparin induced thrombocytopenia (HIT) or where there is more chance of bleeding like thin elderly female patients and patients with old history of bleeding or cerebrovascular accidents we use Bivaluridin infusion as per recommended dosage<sup>9</sup> but we make sure that the infusion is continued atleast for first 4-6 hours after the procedure so as to avoid any untoward subacute stent thrombosis<sup>10</sup>. Third generation DES are the preferred stents of choice and we use open cell design stents likes Resolute Integrity or Synergy whenever we happen to deal with bifurcation lesions involving bigger side branches. When exact ostial placement of stent is required the Everolimus coated Xience Platform stents could be preferred as the stent starts exactly from the marker unlike other designs where the stent starts distal to the radiopaque marker.

We always stent the distal lesion first before addressing the proximal so as to avoid problems of difficulty in entry of stents through curves and bends within the proximal stent placed. But if the proximal lesion is so critical with TIMI one flow we might do stenting proximally first so as to avoid ischemia and do proper placement of the distal stent when the flow is good distally. It is always preferable to pre dilate the lesion if the lesion is tight especially when there is suspicion of calcification which might cause stent under expansion later. We follow the protocol of aggressive post dilatation of stents if there is suspicion of under expansion as seen by imaging modalities like Stent Viz (or other better visualization protocols)during the procedures with non complaint higher sized balloons as we all know that the follow up results will be good if the immediate appearance after the PCI is good. The only exception to this Pre & Post dilatation principles are in ACS scenarios where the slow flow and other complications could be more with pre & Post dilatations<sup>11</sup>. We always recommend usage of intracoronary imaging when dealing with LM lesions & PCI. All patients are observed overnight in monitored settings and discharged the next day with dual antiplatelet drugs and high dose statins. Risk factor modifications both life style and drug therapy is highly emphasized to patients while discharge. We call patients telephonically the next day at home to find out if there are any minor issues or troubles and ask them to come for hospital follow up at 6 weeks and then every 3months till next one year. We do full evaluation with all the necessary blood work up, echocardiogram and some form stress evaluation to all patients at the end of one year. Follow up check angiogram is performed only when there are some classical symptoms or when there is some suspicion of ischemia in noninvasive evaluation.

**Conclusions:** MVD contributes to significant number of patients

both in ACS & Stable angina settings in our country. MV PCI using latest third generation DES with plan for complete revascularization and image& FFR guidance as and when required is a good alternative to CABG especially in younger sub group of patients in our country.

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