Indian Journal of Clinical Practice, Vol. 30, No. 2, July 2019

INDIA LIVE 2019

MARCH 01, 2019 | RENAISSANCE MUMBAI CONVENTION CENTRE HOTEL, POWAI, MUMBAI

PATHOLOGICAL INSIGHTS INTO MITRAL VALVE INTERVENTION

Dr Renu Virmani, USA

Mitral valve is a complex structure. The entire structure of mitral valve consists of anterior and posterior leaflets, chordae tendineae, papillary muscles, left atrium and a partial annulus which is D-shaped. The pathophysiology of mitral regurgitation is also complex, involving defect in leaflets, chordae, annulus and papillary muscle and LV wall. Surgical repair has worked but not surgical valve replacement. Therefore, repair is more likely to be a better treatment. In patients with high operative surgical risk, transcatheter valve repair is more reasonable than surgical replacement.

AORTIC DISSECTION DURING CORONARY INTERVENTION

Dr Ruchit Shah, Mumbai

Aortic dissection is a rare complication (0.005%). Most of the dissections occur during guide catheter manipulation. Right coronary artery is more frequently involved. JR and AL are responsible for most of the aortic dissections. It is best to prevent this complication by ensuring the correct guide size, curvature and coaxial alignment. Always look for pressure, damping or ventricularization and give gentle contrast injections. Aortic dissection during PCI is detected by aortogram, bedside echocardiography, transesophageal echocardiography and CT scan. Dissection of aorta limited to the ipsilateral cusp or <4 mm from cusp can be treated by stenting and has good prognosis. Dissections which extend >4 mm from the cusp may require surgery and have a guarded prognosis. Management of hemodynamics and life-threatening arrhythmias is of prime importance.

FFR IN SPECIAL SUBSETS

Dr CG Bahuleyan, Thiruvananthapuram

- In serial lesions, the FFR of individual lesions should not be used. Measure the pressure gradients across lesions during pull back with hyperemia to decide which lesion is to be stented.
- In LM with LAD disease to decide which lesion is significant, place the pressure wire distal to LAD lesion; achieve adenosine hyperemia and record FFR:
  - FFR >0.80: Both lesions insignificant, no stenting
  - ≤0.80 and ≤0.60: Treat LAD and repeat FFR to assess LM stenosis
  - ≤0.80 and >0.60: Place pressure wire in LCx to assess LM FFR
  - FFR apparent: >0.80 - Stent LAD lesion; ≤0.80 - Consider treating both LM and LAD lesions.

WHAT IS THE ROLE OF OCT GUIDANCE IN CALCIFIED LESIONS?

Dr Balbir Singh, Gurugram

The presence of calcified and rigid lesions makes PCI challenging. Adjuvant techniques are often required to achieve satisfactory stent results. Angiography has low sensitivity (48%) for calcium detection, except for severe calcification. Optical coherence tomography (OCT) is a tool that precisely detects calcium as a signal poor heterogeneous region with sharply defined borders. OCT estimates the area of calcification more accurately than intravascular ultrasound (IVUS) as the light penetrates calcium without shadowing. OCT also helps the operator to distinguish between superficial and deep calcium with accurate measurement of the minimum distance from the lumen, the thickness of the calcium, and arc of calcium. OCT could thus be a more useful clinical tool for quantifying calcified lesions. Total calcium arc >180° and increased calcium thickness of >0.5 mm are associated with greater risk of stent underexpansion. OCT is the ideal method to capture these parameters and indicate or defer the use of atherectomy before stent implantation and guide optimization of PCI.

HOW CAN WE BENEFIT THE PATIENTS BY INCORPORATING NEWER TECHNOLOGIES INTO PRACTICE?

Dr Rajesh Dave, USA

Interventional technologies in the field of Cardiology have changed the way diseases are diagnosed and

treated. Interventional Cardiologists are faced with challenging situations every day with decision-making in terms of whether to proceed with stenting or surgery, ascertaining the correct stent placement, especially in case of multivessel disease, calcified lesions, long blockages, edge dissection as well as need for revascularization in intermediate lesion.

Newer technologies, like OCT, are a great help in planning of interventional strategies and optimization before and after the stent deployment, particularly with complex diseases. New age imaging tools help improve patient outcomes by limiting geographic misses, stent malapposition, under-expansion, etc., thus translating into better long-term clinical results.

FFR TO GUIDE PRECISION PCI OF CAD

Dr Ajit Mullasari, Chennai

Unlike coronary angiography alone, fractional flow reserve (FFR) assists interventional cardiologists in accurately determining whether coronary atherosclerotic plaques are responsible for myocardial ischemia, and need to be revascularized.

FFR is unparalleled in diagnostic accuracy when compared to nonhyperemic indices and noninvasive techniques. It continues to be the gold standard for detection of ischemia-inducing coronary stenoses. FFR-guided PCI has been found to be superior to angiography-guided PCI and over medical therapy alone.

FAME 2 trial investigators clearly demonstrated that in patients with stable CAD, FFR-guided PCI, as compared with medical therapy alone, improved the outcome. A meta-analysis supported current guidelines advising FFR-guided PCI strategy for CAD.

FFR-guided PCI was found to be associated with lower MACE/MACCE, death, MI, repeat revascularization, and death or MI than angiography-guided PCI strategy.

Revascularization guided by FFR in patients with CAD and stenoses >50% yields better outcomes than revascularization based on a visual analysis of angiographic stenosis severity alone.

DEFER and FAME trials have shown that in patients with stable CAD, conservative management of stenoses that could be angiographically severe, but are not hemodynamically relevant, is safe.

FFR is, therefore, an ideal tool to guide treatment in CAD.

DURABLE POLYMER DES VS. BIODEGRADABLE POLYMER DES

Dr Keyur Parikh, Ahmedabad

Durable polymer DES (DP-DES) have been studied in a large number of patients and also in those with comorbidities like diabetes, high bleeding risk, etc., along with complex lesions like chronic total occlusion (CTO), left main, etc. Biodegradable polymer DES (BP-DES) have not demonstrated superiority to DP-DES. BP-DES still have to prove superiority in terms of safety and efficacy in complex lesions. BP-DES change to BMS following drug-elution, and in clinical and pre-clinical trials, DP-DES have proven to be superior to BMS. BP-DES have still not shown superiority of safety and efficacy vs. current generation DP-DES in randomized clinical trials.

Researchers showed in ISAR-TEST (Intracoronary Stenting and Angiographic Results: Test Efficacy of 3 Limus-Eluting Stents) 4 that in head-to-head comparisons between three DES, biodegradable polymers did not make for better long-term outcomes. BP-DES have, at best, been shown to be noninferior to the durable-polymer standard. There seems to be no real late advantage to BP-DES.

DAPT DURATION AND REGIMEN

Prof (Dr) Ashok Seth, New Delhi

Dual antiplatelet therapy (DAPT) is the cornerstone of pharmacological treatment aimed at preventing the atherothrombotic complications in patients with several coronary artery disease (CAD) manifestations. Physicians face several challenges while prescribing DAPT that include selecting the appropriate P2Y12 inhibitor and determining the optimal duration of DAPT while minimizing the risk of ischemic and bleeding complications in light of each patient's clinical characteristic and circumstance.

The ACC/AHA guidelines recommend that for patients with ACS treated with DAPT following BMS or DES implantation, P2Y12 inhibitor therapy (clopidogrel, prasugrel, or ticagrelor) should be given for at least 12 months. In patients treated with DAPT, a daily aspirin dose of 81 mg (range, 75 mg to 150 mg) is recommended. The guideline further recommends that in patients treated with DAPT after coronary stent implantation who subsequently undergo CABG, P2Y12 inhibitor therapy should be resumed postoperatively so that DAPT continues until the recommended duration of therapy is completed. In patients with ACS

(NSTE-ACS or STEMI) being treated with DAPT who undergo CABG, P2Y12 inhibitor therapy should be resumed after CABG to complete 12 months of DAPT therapy after ACS. Additionally, in patients with ACS managed with medical therapy alone (without revascularization or fibrinolytic therapy) and treated with DAPT, P2Y12 inhibitor therapy (clopidogrel or ticagrelor) should be continued for at least 12 months.

According to the ESC guidelines, for stable CAD patients treated with PCI, the duration of DAPT is 1-6 months depending on the bleeding risk. For patients in whom the ischemic risk prevails over the risk of bleeding, a longer DAPT duration may be considered. For ACS patients irrespective of the final revascularization strategy (medical therapy, PCI, or CABG), the default DAPT duration is 12 months. Six-month therapy duration should be considered in high bleeding risk patients, while >12-month therapy may be considered in ACS patients who have tolerated DAPT with a low bleeding risk. Clopidogrel is considered the default P2Y12 inhibitor in patients with stable CAD treated with PCI, those with an indication for concomitant oral anticoagulation, as well as in ACS patients in whom ticagrelor or prasugrel are contraindicated. Some studies have found no increased risk of stent thrombosis with shorter-duration DAPT (3-6 months). A shorter duration of DAPT results in fewer bleeding complications. Shorter-duration DAPT may be most reasonable in patients currently being treated with "newer-generation" (eg, everolimus-eluting) DES, which are associated with lower stent thrombosis and MI rates than those of "first-generation" DES.

In line with this, the STOPDAPT trial assessed the outcome with 3-month DAPT duration after CoCr-EES implantation. The event rates beyond 3 months were very low (cardiovascular death: 0.5%, MI: 0.1%, ST: 0%, stroke: 0.7%, and TIMI major/minor bleeding: 0.8%). Cumulative 1-year incidence of the primary endpoint (composite of cardiovascular death, MI, stroke, definite stent thrombosis (ST) and TIMI major/minor bleeding) was 2.8%, which was lower than the pre-defined performance goal of 6.6%. Using the CoCr-EES group in the RESET trial as a historical comparison group, where about 90% of patients had continued DAPT at 1 year, cumulative incidence of the primary endpoint tended to be lower in the STOPDAPT than in the RESET (2.8% versus 4.0%) and adjusted hazard ratio was 0.64. The cumulative incidence of definite/probable ST was lower in the STOPDAPT than in the RESET [0 patient (0%) versus 5 patients (0.3%)]. The study concluded that stopping DAPT at 3 months in selected patients after CoCr-EES implantation was at least as safe as the prolonged DAPT regimen adopted in the historical control group.

Decisions about the timing of surgery and whether to discontinue DAPT after coronary stent implantation must be individualized. Such decisions involve weighing the particular surgical procedure and the risks of delaying the procedure, the risks of ischemia and stent thrombosis, and the risk and consequences of bleeding.

WHY IS STENT QUALITY IMPORTANT?

Dr MS Hiremath, Pune

A stent, once implanted, stays in the patient's body forever. Stent technologies are complex and all stents are not same. Each brand undergoes varied innovation and testing procedures.

Therefore, it is important that a good quality stent, with a proven safety and efficacy profile from long-term clinical data from various clinical trials is selected for the patients. DES brands approved by US FDA offer the most robust technology, stringent approval process and best clinical evidence.

The key expectations from a stent include - Good deliverability and flexibility; good scaffolding; high radial strength with minimum recoil; good visibility; minimal foreshortening; side branch accessibility; appropriate metal to artery ratio; biocompatibility; optimal stent delivery system; variety of size and lengths; drug and polymer.

Along with all of these factors the comorbidity of the patient and lesion should be taken into account, so it is very important to select a stent which has an indication approval such as diabetes mellitus, CTO, ACS, etc., which is suitable for the lesion and the patient.

HOW CAN OCT HELP IN IMPROVING OUTCOMES IN BIFURCATIONS LESIONS?

Dr Rajneesh Kapoor, Gurugram

Optical coherence tomography (OCT) has approximately 10 times higher resolution than IVUS. It can precisely measure lumen diameters in the variable geometry of a bifurcation lesion and identify superficial lipid laden plaques and calcium, relevant to confirm the severity of the lumen obstruction prior to treatment and guide location and diameter of the stent. OCT produces fewer strut-induced artifacts and

offers precise evaluation of strut apposition in a real-life clinical setting. The increase in the speed of image acquisition with the introduction of frequency domain OCT allows rapid pull-back at a speed of 36 mm/sec, minimizing the amount of contrast required to clear blood during image acquisition. This enables serial OCT acquisitions, particularly before treatment if the lesion is not very severe and flow is expected to be present around the OCT catheter, after predilatation and to assess and guide stent expansion.

Repeated OCT examinations at follow-up can help in the detection of presence and characteristics of strut coverage, which can predict late stent thrombosis. These applications are of particular interest in the context of bifurcation lesion treatment as this condition is still associated with a higher number of malapposed stent struts and frequent impairment of stent expansion.

OCT can provide unique insights in the setting of bifurcation lesions by enabling detailed evaluation of coronary bifurcation pathology and facilitating procedural planning. OCT imaging has contributed enormously to the optimization of bifurcation stenting techniques. With its high resolution, OCT enables interventionalists to re-cross proper stent cell, which is the key procedure in both provisional stenting and 2-stent techniques. Poststenting OCT imaging provides unique information for further optimal treatment strategy.

OCT is a better tool as compared to angiography as it depicts ostial lesions in bifurcation without the misleading two-dimensional appearance of angiography such as overlap and foreshortening. OCT can help reconstruct a bifurcation in three dimensions and can assess the side branch ostium from 3D reconstruction of the main vessel pull-back, which can be applied to ensure optimal re-crossing position of the wire after main vessel stenting.

Its ability to provide unique information on the plaque at high risk for rupture, plaque composition, thickness of fibrous cap, the presence of macrophage and thrombi has assisted in simple PCI as well as in complex bifurcation lesions PCI.

OCT helps provide valuable anatomic information to optimize stent implantation and adapt PCI strategy in individual patients.

OCT IN CTO: STRONG CLINICAL EVIDENCE

Dr Girish Navasundi, Bengaluru

PCI of CTOs is challenging. It is associated with low success rates, increased restenosis and reocclusion. CTOs of arteries are more challenging lesions to treat with angioplasty and stenting as compared to stenotic vessels primarily on account of the difficulty in guiding the wire across the lesion. Angiography alone cannot differentiate between the occluded lumen and the vessel wall and to characterize the content of the occlusion. Angiography provides a two-dimensional image of contrast-filled lumen, and does not allow an accurate assessment of the plaque.

OCT is a high resolution imaging technique that can improve the understanding of the vascular response after stenting of chronically occluded vessels. OCT correctly identifies tissue composition within the CTO, such as the presence of collagen and calcium and can identify intraluminal microchannels. OCT imaging of CTO anatomy and tissue characteristics can possibly result in significant improvements in PCI interventions by providing novel guiding capabilities.

In the ACE-CTO study, OCT was performed 8-months post stenting. High rates of stent strut malapposition and incomplete stent strut coverage were observed after CTO PCI using EES. The study highlighted unique challenges associated with stent implantation in CTOs.

The PRISON-IV trial showed inferior outcome in patients with CTOs treated with the ultrathin-struts (60 μm for stent diameter ≤ 3 mm, 81 μm >3 mm) hybrid-sirolimus eluting stents (SES) compared with everolimus eluting stents (EES, 81 μm). A recent study evaluated if the use of smaller stents (≤3 mm) was responsible for the inferior outcome reported in the trial. The study population was divided according to the different size of stents implanted in those receiving only stents with diameter ≤3 mm (Group-A, 178 patients), only stents >3 mm (Group-B, 59 patients), and those receiving stents of both sizes (Group-C, 93 patients). OCT was performed in 60 patients at follow-up, and documented a mild trend toward lower values of minimum in stent area in Hybrid-SES arm of Group A (4.4 ± 1.02 mm^2 vs 5.0 ± 1.28 mm^2, respectively, P = 0.16).

OCT can thus provide significant information in CTOs.

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