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OCT FOR CHRONIC TOTAL OCCLUSIONS

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Percutaneous coronary intervention (PCI) of chronic total occlusions (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 than stenotic vessels, primarily due to the difficulty in guiding the wire across the lesion. Angiography alone cannot differentiate between the occluded lumen and the vessel wall and characterize the content of the occlusion. Angiography provides a two-dimensional image of the contrast-filled lumen and does not allow an accurate assessment of the plaque.

Optical coherence tomography (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 collagen and calcium can identify intraluminal microchannels. OCT imaging of CTO anatomy and tissue characteristics can significantly improve PCI 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 everolimus-eluting stent (EES). The study highlighted unique challenges associated with stent implantation in CTOs.

The PRISON-IV trial showed inferior outcomes 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 EES (81 μm). Another recent study evaluated if using smaller stents (≤3 mm) was responsible for the inferior outcome reported in the trial. The study population was divided according to the different sizes of stents implanted in those receiving only stents with a diameter of ≤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 the 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 important information in CTOs.

FRACTIONAL FLOW RESERVE AND NONHYPEREMIC PRESSURE RATIOS – BE METICULOUS IN ACQUISITION AND INTERPRETATION

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Fractional flow reserve/Nonhyperemic pressure ratios (FFR/NHPR) exposes the 'functional' aspect of a stenosis and is affected by the following parameters: a) Epicardial coronary artery anatomy, b) extent of perfused territory, c) microvascular function (RESISTANCE) and d) collateral flow.

The anatomic severity of stenosis which we assess by coronary angiography is just one component only. That is why coronary physiology assessment scores over angiography. We have to be meticulous in assessing FFR/NHPR. Minor errors in techniques can lead to erroneous values and can influence the management of the patient.

Rules in measuring FFR

- Pressure zeroing of both Pa and the Wire (Pd) should be done meticulously.
- Once zeroing done, the level of the Pa transducer should not be changed.
- Equalization of Pa and Pd should be done with the transducer (located at the proximal part of the dark end of the wire) just inside the proximal coronary.
- Look for Tuohy Borst leak while equalizing and also the introducer needle should be out of the Tuohy.
- For osteal lesions – Equalization to be done with the transducer in the aortic sinus rather in the coronary.
- The guiding catheter should be frequently flushed with normal saline before any measurement to avoid contrast induced damping of Pa.
- The wire to be placed 2-3 cm distal the lesion which is assessed to avoid error due to pressure recovery.
- Nitroglycerin (NTG) should be given for epicardial vessel dilation and adenosine for microvascular dilation.
- Guide catheter should be carefully positioned in osteal lesions and FFR should be measured only when guide is disengaged. Always look for wedging of Pa.
- Measure the FFR during steady state hyperemia and 3-5 beat average measurement is better.

- Pull back verification is **THE MOST IMPORTANT STEP.** Once measurement is over pull back the wire to the position where it was equalized and check whether the value is 1. If >5 mmHg difference, repeat the measurement.
- Pullback verification is done to assess – DRIFT- A phenomenon inherent to piezoelectric systems like the FFR wires.
- Scar tissue can give higher FFR values (negative) as FFR correlates with the perfused myocardial territory.
- Left ventricular hypertrophy, high left ventricular end-diastolic pressure and presence of collaterals can affect FFR.
- For measurement of NHPR – Techniques are the same, but it has to be measured in "true" resting state. Wait 30-45 seconds after contrast/NTG.

ANATOMY CONSIDERATIONS IN PLANNING THE FIRST TAVR

Dr Raj Makkar, USA

Transcatheter aortic valve replacement (TAVR) is a minimally invasive heart procedure to replace a thickened aortic valve that cannot fully open. In the US TVT Registry, 3% to 7% of the TAVRs are for bicuspid AS. It indicated that TAVR is being used selectively in bicuspid AS, and the related data should be interpreted accordingly.

The acceptance of the use of TAVR in high-risk patients was based on evidence from clinical trials that used early-generation TAVR devices. However, these procedures were associated with considerable procedure-related complications. Increased operator experience and enhanced transcatheter valve systems have led to a worldwide trend to use TAVR in patients at low or intermediate risk. This trend has been evaluated in small observational studies, but most patients who are currently recommended for surgery are at low or intermediate risk.

Hence, some of the important inferences drawn from several small studies are:

- Favorable outcomes with TAVR in carefully selected patients with Sapien and Evolut on real-life TVT and sponsored prospective registries.
- CT phenotyping is important in patients' selection and procedure planning.
- While bicuspid TAVR is justifiable irrespective of surgical risk, high-risk anatomical features and/or concomitant aortopathy should prompt consideration for surgical aortic valve replacement (SAVR) in low-risk patients.
- Randomized trials/prospective registries are needed, especially in patients with lower surgical risk.
- Important to consider the lifetime management of patients when deciding between TAVR and SAVR in younger patients who are likely to require multiple procedures over a lifetime.

DEDICATED SIDE BRANCH STENT: WHEN, WHERE AND HOW TO USE?

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Bifurcation lesions are complex, technically tricky and have a higher rate of adverse events and lower success rates. It has been seen that bifurcation intervention is required in approximately 20% of PCIs.

While current guidelines and expert consensus recommend provisional stenting for managing bifurcation lesions, a two-stent strategy must be considered if the side branch (SB) displays a diameter ≥2.5 mm and if the lesion exhibits significant stenosis within the SB ostium.

This has led to the introduction of dedicated bifurcation stents, generally deployed along with main-vessel (MV) stents. Therefore, the important steps to remember in the deployment of the stent are:

- Prepare and pre-dilate the SB lesion with a balloon
- Deployment of BIOMIME branch
- Post-dilation with a balloon
- Prepare the main branch (MB) lesion and position the workhorse stent
- Kissing balloon technique in both MB and SB.

On the other hand, if one faces any difficulty in wiring the SB, there are two approaches to resolving the issue:

- Wire-based option
  - Create or increase the secondary bend
  - Try a different wire after considering Torquability, hydrophilic
  - Pullback of angulated MB wire or dedicated hairpin technique
- Microcatheter-based approach
  - Direct highly angulated wire from straight tip MC
  - Use of angulated MC to direct wire
  - Use of dual lumen MC to direct wire.