24th CARDIOVASCULAR SUMMIT

TCTAP2019 Daily News

Inside this Issue

Sunday, April 28, 2019

Seung-Jung Park, MD
Asan Medical Center,
Korea

Welcome

Inside TCTAP 2019: TCTAP, Where Access to Constant Challenges and Enthusiasm for Educational Goals is Possible

Welcome to TCTAP 2019! Writing a history of constant changes and evolutions, TCTAP has been committed to a medical exchange that expresses diverse perspectives and ideas in the cardiology intervention field.
This year, we are focusing on expanding the opportunities for educational exchanges and providing more practical scientific programs in an effort to keep building momentum as one of the must-attend conferences. We hope that every attendee enjoys the compact, concentrated four days with following highlights.

Live Case Demonstrations from World-Renowned Centers

TCTAP 2019 will stream 35 live cases from 4 world-leading medical centers across nations.
Top international operators will show how to treat diseases and provide up-to-date expertise while covering all aspects of current issues in cardiology.

Late-Breaking Research from Asan Medical Center & Spotlights on Major Clinical Trials with Expert's Opinion

The latest breakthrough researches of cardiovascular intervention will be revealed, as well as new data from the affiliated hospital, Asan Medical Center. We are certain that the presentations and subsequent debates on these impressive trials will be of great educational value. Do not miss the featured session of clinical research from abstracts which are published online in a supplement issue of the Journal of the American College of Cardiology (JACC).

Continued on page 9

Today's Highlights

Opening of TCTAP 2019
9:40 AM - 10:15 AM
Main Arena, Level 3

TCTAP Award 2019
"Master of the Masters"
11:40 AM - 12:00 PM
Main Arena, Level 3

Coronary Symposium
4:00 PM - 6:00 PM
Coronary Theater, Level 1

Training Center
2:00 PM - 6:30 PM
Training Center, Level 1*

Moderated Abstract and Complex Case Competition
2:00 PM - 6:00 PM
Abstract & Case Zone, Level 1

Evening Symposium
6:00 PM - 8:15 PM
Room 205, Level 2

Satellite Symposium: Morning Roundtable Forum
7:00 AM - 8:10 AM*

Lunchtime Activities
12:45 PM - 1:45 PM*

*For details on the locations, please check TCTAP 2019 App

General Information

Shuttle Bus

Free shuttle bus will run between COEX and several hotels.
Visit the **CVRF Booth** for more information.

Certificate of Attendance

Certificate of Attendance for TCTAP 2019 will be distributed along with the badge.

Cyber Station / Free Mobile Recharge

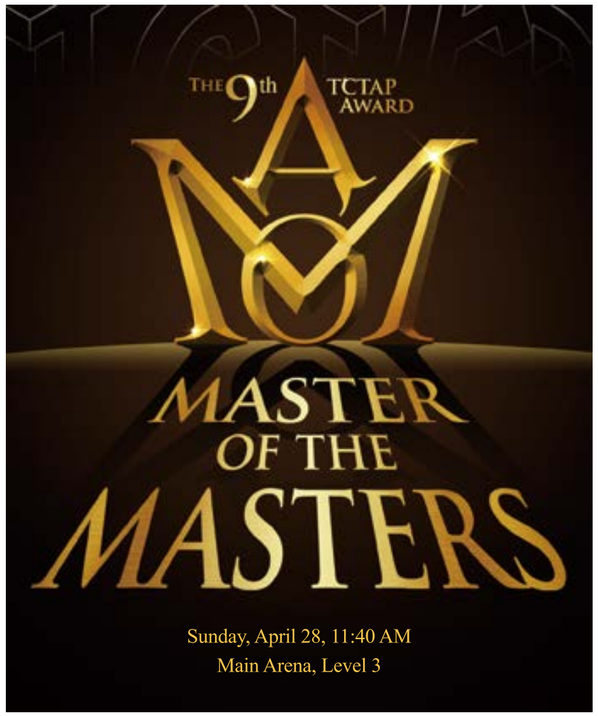
- CVRF Booth, Grand Ballroom Lobby, Level 1
- Lounge, Exhibition (B2) Hall, Level 1
- Lounge next to Registration Booth, Exhibition (B2) Hall Lobby, Level 1

Registration / Lost and Found / Coat Room

- Opening Hours:
  8:30 AM - 6:30 PM, Saturday, April 27
  6:00 AM - 6:00 PM, Sunday, April 28 - Tuesday, April 30
- Registration Booth, Exhibition (B2) Hall Lobby, Level 1

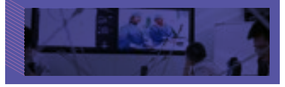
Tour Information

- Grand Ballroom Lobby, Level 1
- Tour information will be provided by COSMO JIN Tour and Korea Tourism Organization.



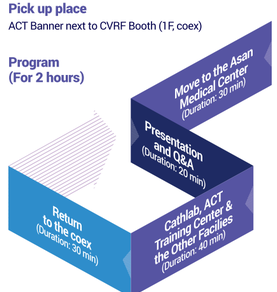
ACT Tour @ TCTAP 2019

Please join the ACT Tour to experience ACT Program at Asan Medical Center.



Pick up place
ACT Banner next to CVRF Booth (1F, coex)

Program (For 2 hours)



Time Table

Date	Section	Departure Time
April 29 (Mon.)	Tour 1	10:00 AM
	Tour 2	02:00 PM

How to Register * First Come, First Served Basis

On-site Registration:
ACT Desk at CVRF Booth (1F, coex)
For more about ACT Program, Please visit to http://www.cvrf.org/act

CVRF — For More Information www.cvrf.org/act

Program at a Glance + Partnership Session Schedule

	Main Arena *Level 3*	Coronary Theater *Level 1*	Presentation Theater 1 *Level 1*	Presentation Theater 2 *Level 1*	Other Session Rooms	Abstract Zone I, II *Level 1*	Case Zone I, II, III *Level 1*
07:00		Satellite Symposium - Morning Roundtable Forum					
07:30							
08:00							
08:30	Live Case Session I						
09:00							
09:30	Opening						
10:00							
10:30	Live Case Session II						
11:00							
11:30	Master Award						
12:00							
12:30							
13:00		Satellite Symposium - Lunchtime Activities					
13:30							
14:00							
14:30	Heart Keeper *Korean Session	Partnership Session TCT @ TCTAP	Hot Topics Antithrombotics	Partnership Session CIT @ TCTAP		Moderated Abstract Competition	Moderated Complex Case Competition
15:00							
15:30			Hot Topics DES, BRS and DCB				
16:00				Partnership Session CCT & TCTAP			
16:30		Live Case & Lecture Session I					
17:00			Hot Topics Renal Denervation & LAA Closure				
17:30							
18:00							
18:30							
19:00	Gala Evening *Invitation Only				Satellite Symposium Evening Symposium		
19:30							
18:00							

Partnership Sessions with International Societies and Meetings

TCT @ TCTAP 2019
Co-organized by TCT
- 2:00 PM - 4:00 PM
  @ Coronary Theater, Level 1

Part I: Structural Heart Disease
Part II: Coronary Artery Disease

CIT @ TCTAP 2019
Co-organized by CIT
- 2:00 PM - 3:15 PM
  @ Presentation Theater 2, Level 1

Clinical Research and Practice on Acute Myocardial Infarction in China

CCT @ TCTAP 2019
Co-organized by CCT
- 3:30 PM - 5:00 PM
  @ Presentation Theater 2, Level 1

Part I: How to Achieve Optimal Result: Physiology and Imaging Guided PCI
Part II: How to Achieve Maximum Success: CTO PCI

TCTAP Wrap-up Interviews

Here the most debated issues will be discussed in an interactive way. TCTAP 2019 Wrap-up Interviews are 20-minute moderated interview sessions in open studio.

The purpose of these interviews is to address professional knowledge and experience on selected topics in details with world's leading experts in the field of cardiovascular medicine. Distinguished experts will provide various aspects of the selected topics and exchange lessons learned through open discussions.

Saturday, April 27

Imaging
12:45 PM - 1:05 PM
Moderators: Myeong-Ki Hong, Akiko Maehara
Interviewees: Takashi Akasaka, Ik-Kyung Jang, Evelyn Regar

Physiology
1:15 PM - 1:35 PM
Moderators: William F. Fearon, Seung-Jung Park
Interviewees: Javier Escaned, Nils Johnson, Bon-Kwon Koo

Sunday, April 28

Antithrombotics
3:20 PM - 3:40 PM
Moderators: Dominick J. Angiolillo, David J. Cohen
Interviewees: Davide Capodanno, Joo-Yong Hahn, Raj Makkar

DES
5:00 PM - 5:20 PM
Moderators: Stephen G. Ellis, Patrick W. Serruys
Interviewees: Aloke V. Finn, Michael Haude, Yoshinobu Onuma

Monday, April 29

Complex
11:00 AM - 11:20 AM
Moderators: Marie-Claude Morice, Chiung-Jen Wu
Interviewees: Aloke V. Finn, Akiko Maehara, Philip M. Urban

LM & Bifurcation
12:30 PM - 1:00 PM
Moderators: Seung-Jung Park, Gregg W. Stone
Interviewees: Antonio Colombo, Thierry Lefevre, John Ormiston

Valve
4:30 PM - 4:50 PM
Moderators: Alain G. Cribier, Eberhard Grube
Interviewees: David J. Cohen, Vinayak Bapat, Jian (James) Ye

Completed interviews will be broadcast on our websites at **www.summit-tctap.com, www.youtube.com/CVRFevents,** and on **TCTAP mobile application**.

TCTAP 2019 TRAINING CENTER OPEN!

Training Center, Opposite of the Registration, Level 1

SATURDAY, APRIL 27

Session	Place	Time
Bifurcation Stenting Seminar 1 with Terumo	Training Center 3	4:00 PM - 5:30 PM

SUNDAY, APRIL 28

Session	Place	Time
Advanced TAVR with Edwards	Training Center 1	2:00 PM - 3:30 PM
Renal Denervation & TAVR with Medtronic	Training Center 2	2:00 PM - 3:30 PM
Bifurcation Stenting Seminar 2 with Terumo	Training Center 3	2:00 PM - 3:30 PM
Antegrade Dissection and Re-Entry (ADR) with Boston Scientific	CTO Training Center	2:30 PM - 3:30 PM
Bifurcation Stenting Seminar 3 with Terumo	Training Center 3	4:00 PM - 5:30 PM
Above the Call of Duty - PCI Optimization with OCT (Abbott)	Training Center 2	5:00 PM - 6:30 PM

MONDAY, APRIL 29

Session	Place	Time
Above the Call of Duty - PCI Optimization with OCT (Abbott)	Training Center 2	9:00 AM - 10:30 AM
Basic TAVR with Edwards	Training Center 1	10:00 AM - 11:30 AM
CTO Training Course: Lectures	CTO Training Center	10:30 AM - 12:10 PM
Angiojet (Pharmaco-Mechanical Thrombectomy) with Boston Scientific	Training Center 2	11:00 AM - 12:00 PM
Renal Denervation & Primary Prevention with Medtronic	Training Center 1	2:00 PM - 3:00 PM
Peripheral Intervention with Abbott	Training Center 2	2:00 PM - 3:30 PM
Bifurcation Stenting Seminar 4 with Terumo	Training Center 3	2:00 PM - 3:30 PM
CTO Training Course: CTO Hands-on Training	CTO Training Center	2:00 PM - 5:00 PM

* All training programs are available after application in advance.

Onsite Registration

- **Location :** Exhibition & Training Center Booth, Registration (B2 Hall Lobby, Level1, COEX)
- **Running Hour**
  April 27(Sat), 2019 | 8:30 AM ~ 6:30 PM
  April 28(Sun), 2019 ~ April 29(Mon), 2019 | 6:00 AM ~ 6:00 PM

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24th CARDIOVASCULAR SUMMIT
TCTAP2019
April 27 ~ April 30 COEX, Seoul, Korea

Get the latest information and more photos
www.facebook.com/SummitTCTAP

Stay Informed

With TCTAP 2019 Breaking News

Webcast.summitmd.com

Live Case Transmission from World-Renowned Medical Centers

Asan Medical Center, Seoul, Korea

- 8:10 AM - 9:40 AM @ Main Arena, Level 3
- Operator(s): (Case #1) Seung-Jung Park, Hojin Kim, Do-Yoon Kang
  (Case #2) Jung-Min Ahn, Eberhard Grube, Cheol Hyun Lee
  (Case #3) Duk-Woo Park, James Flaherty, Euihong Ko
- 10:15 AM - 11:40 AM @ Main Arena, Level 3
- Operator(s): (Case #4) Do-Yoon Kang, Cheol Hyun Lee
  (Case #5) Jung-Min Ahn, Sang-Cheol Cho
  (Case #6) Duk-Woo Park, Hanbit Park
- 4:00 PM - 6:00 PM @ Coronary Theater, Level 1
- Operator(s): (Case #1) Thierry Lefevre, Kyusup Lee
  (Case #2) Duk-Woo Park, Cheol Hyun Lee
  (Case #3) Jung-Min Ahn, Osung Kwon

Imaging & Physiology

Nils Johnson, MD
McGovern Medical School at UTHealth, USA

Top 10 Issues in FFR Measurement

Over the past year, several "top 10" issues for fractional flow reserve (FFR) stand out as important. Some of these topics will be addressed in detail by other speakers during the physiology session in TCTAP 2019. For example, the meaning and accumulating data regarding FFR measured immediately after percutaneous coronary intervention (PCI) spoken by Joo Myung Lee is worthy to listen. And William F. Fearon will summarize the hardware developments for intracoronary pressure sensor devices–now six different companies on the market globally. Also, two specific lectures addressing the discordances between FFR and hyperemia free indexes should not be missed.

There were more than 400 publications since TCTAP 2018, and I would like to present three notable outcomes. First, this January, a pooled data from three randomized controlled trials (FAME 2, PRIMULTI, and Compare-Acute) was published. This individual patient data meta-analysis suggests that FFR-guided PCI compared to medical therapy reduces a composite endpoint of death and myocardial infarction (MI) in stable coronary lesions **(Figure 1)**.

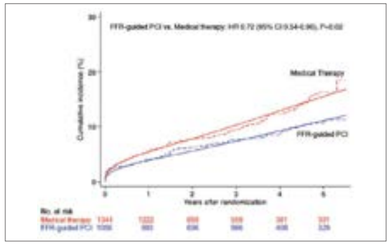

Figure 1. PCI stabilizes lesion at short-term cost but long-term benefit

Intriguingly, this positive result arose completely via a reduction in spontaneous MI. Indeed, the short-term risk due to the PCI itself actually increases slightly. As a result, the rationale for FFR-guided PCI in stable lesions has become even stronger.

Additional work has proposed a mechanism for the reduction of MI. In the EMERALD trial, vulnerable plaque features such as positive remodeling, noncalcified plaque volume, spotty calcification together with the presence of adverse hemodynamic characteristics detected on CT angiography showed significantly higher risk (hazard ratio 11.7, p=0.001) of a subsequent acute coronary syndrome than none of those findings **(Figure 2)**. If untreated, the natural history of heightened vulnerability leads to acute plaque rupture when

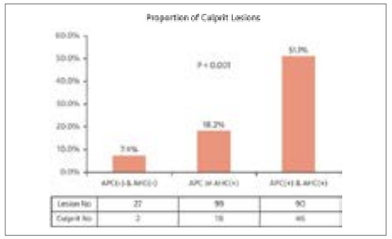

Figure 2. Natural history leads to plaque rupture

exposed to the repetitive mechanical stress of an epicardial pressure gradient quantified by a low FFR.

From the PACIFIC trial, the relation between quantitative plaque burden or morphology and hyperemic myocardial blood flow was explored. Especially for positive remodeling (PR) and noncalcified plaque volume are associated with detrimental downstream hyperemic myocardial

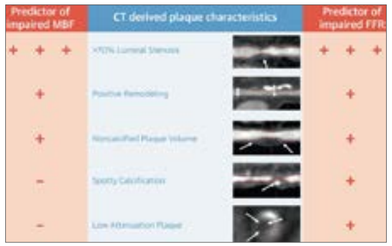

Figure 3. Low FFR lesion showed vulnerable features exposed to mechanical stress

perfusion and FFR **(Figure 3)**. Therefore, the working and novel hypothesis from this synthesis of new FFR literature proposes PCI as mechanical stabilization of vulnerable plaque material. Given those recent technological developments that have advanced the ability of coronary computed tomography angiography (CTA) to quantify plaque burden and evaluate plaque characteristics, a comprehensive assessment could potentially improve the discrimination between ischemic and nonischemic coronary artery disease.

Lastly, several different technologies continue to emerge for simulating FFR from angiographic images acquired either invasively or non-invasively. Building on a 40-year history of fluid dynamic principles, these tools have the potential to serve as gatekeepers to invasive coronary physiology. Four software systems already got approved by European CE mark or FDA and ready to apply for clinical use. Emerging data **(Figure 4)** suggests that non-invasive FFR from angiography better agrees with invasive FFR than

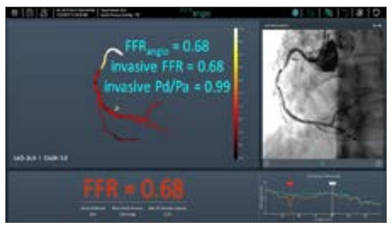

Figure 4. Non-invasive FFR vs. hyperemia free index

hyperemia free indexes like Pd/Pa. For centers seeking to avoid invasive FFR for whatever reasons, this data implies that the invasive pressure wire itself might be rendered completely unnecessary by validated non-invasive FFR with the equivalent diagnostic performance. Following the paradigm of invasive FFR itself, angiography-based FFR could move one step forward by showing equivalence in the clinical laboratory. They need to find a niche as a combined anatomic and physiological modality in the catheterization laboratory.

William F. Fearon, MD
Stanford University School of Medicine, USA

Many Pressure Wires in Cath Lab: Advantage and Disadvantage

Use of fractional flow reserve (FFR) has increased dramatically over the last several years. Along with the growth in the use of FFR, more interventional cardiology industry partners have entered the medical device market. This increasing industry activity reinforces how important FFR is, and that it is not just a footnote in the cath lab. Addressing the concerns of operators and labs about the technical limitations of FFR guidewire systems, five companies now make products for FFR, all aimed at improving the procedure.

Several companies make pressure wire/catheter products and each wire has unique handling characteristics and value-

Feature	Abbott	Acist	Boston	Opsens	Philips
Sensor	Piezo-Electric	Optical	Optical	Optical	Piezo-Electric
Torqueability	-	N/A	+	++	-
Drift	-	+	+	++	-
Reconnection	-	N/A	+	++	-
Display	++	-	+	-	+
Data	++	-	-	-	+
Pressure/Flow	++	-	-	-	++
Co-Registration	-	-	-	-	++

Figure 5. Comparing FFR systems

added features. These features are summarized in **Figure 5**. Current pressure wire sensors are either piezoelectric or optical. Pressure wires also differ from regular workhorse wires, having to incorporate the thin wires or optical fibers that transmit the pressure signals.

Piezoelectric sensors

The piezoelectric sensor wires are made by St. Jude Medical and Philips Volcano. These two companies have the longest historical record for use in the cath lab. Piezoelectric pressure sensors are the most commonly used and widely understood. Piezoelectric pressure sensors measure dynamic pressure. They are typically not suited for static pressure measurements. Based on piezoelectric technology, various physical quantities can be measured; the most common are pressure and acceleration. The improved torque control of the guidewire arises from its specific core wire composition and construction. The sensor is located at the proximal end of the radiopaque flexible wire tip. Although the past performance of pressure wires has been criticized as lower than that of everyday workhorse guidewires, the latest versions appear to be highly competitive. Unique features of the St. Jude Medical pressure system include the wireless connection and thermodilution blood flow measurement for resistance calculations. For Philips Volcano, proprietary software enables the pressure system to compute the instantaneous wave-free ratio value (iFR). In addition, Philips Volcano manufactures a special Doppler-tipped combination pressure and flow wire, useful to study the microcirculation.

Optical sensor guidewires

Two companies, Opsens Medical and Boston Scientific, make pressure wires using optical fibers and sensors. The incorporated thin optical fibers permit construction around a larger, specialized core, making the wire torque closer to that of workhorse wires. Optical sensors used in pressure guidewire use a diaphragm design similar to piezoelectric sensors. The difference resides in the way of measuring the membrane deflection, which is optical rather than electrical.

Joo Myung Lee, MD
Samsung Medical Center, Korea

As blood pressure increases, the membrane deflects inward, which induces a phase delay between two light beams created within the sensor assembly. This so-called Fabry-Pérot interferometer has the effect of modulating the frequency content of the light signal, as opposed to modulating the light intensity. An optical sensor is rarely affected by temperature and moisture, factors that can produce signal drift, although less than piezo transducers.

Optical sensor monorail microcatheter

A unique pressure sensor system is the microcatheter RXi design by ACIST Medical. The RXi pressure catheter also uses fiber-optic technology. The major advantage of this rapid exchange, monorail design is that it permits use over any operator's choice of a favorite guidewire for lesion access and measurement of FFR. The microcatheter is slid across the target lesion, leaving the working wire in place. The catheter has a low and elliptical profile with a .020 x .025-inch shaft. The distal tip containing the optical pressure sensor measures .027 x .036 inches (<3 French) and tapers back to the shaft. The effect of the elliptical construction on flow resistance is intended to produce a minimal contribution to lesion severity despite the additional cross-sectional area.

Special features

Each pressure sensor system offers special features and may be sold as part of a package, including intravascular imaging with intravascular ultrasound (IVUS) or optical coherence tomography (OCT), or synchronized signal overlay with the angiogram during pressure wire pullback. St. Jude Medical's special features include wireless pressure signal connection, the temperature-sensing capability to measure coronary flow reserve and microvascular resistance, and absolute flow. Philips Volcano offers a unique pressure/flow combination wire and the ability to calculate the iFR. ACIST Medical provides a rapid exchange catheter for use with the best, personally selected PCI guidewires and incorporates optical technology. Opsens wire systems have improved wire handling with nitinol construction and employ an optical sensor. Boston Scientific is the newest company in the market. Their system features an Asahi tip, shapeable, and a free-spinning handle. Initial experience suggests highly maneuverable wire handling coupled to optical pressure sensor technology.

Understanding Post-PCI Fractional Flow Reserve

Absolute post-PCI FFR and clinical outcome after PCI

The presence of myocardial ischemia is the most important prognostic indicator in patients with coronary artery disease. Therefore, the purpose of percutaneous coronary intervention (PCI) is to relieve myocardial ischemia caused by the target stenosis, not merely alleviate the stenosis severity. Fractional flow reserve (FFR) is an invasive physiologic index used to define functionally significant coronary stenosis, and its prognostic implications are supported by numerous studies. Contrary to the clear cutoff value and the benefit of FFR in pre-PCI evaluation, there have been various results regarding optimal cut-off values for post-PCI FFR. Nevertheless, the positive association between post-PCI FFR and the risk of future events has been reproduced by several studies. The rationale for post-PCI FFR measurement is to evaluate residual disease burden which cannot be fully assessed by angiographic assessment. Although previous studies showed the association between low post-PCI FFR and increased risk of clinical events, its predictability was reported to be low and the optimal cutoff values ranged widely.

Relative increase of FFR as additional marker of physiologic gain from PCI

PCI with stent implantation is basically a local treatment, and post-PCI FFR reflects both residual stenosis in the stented segment and remaining disease beyond the stented segment in the target vessel. Therefore, a single cut-off value of post-PCI FFR cannot fully discriminate the relative contribution of stented and non-stented disease burden on patient prognosis. The relative increase of FFR with PCI is determined by the interaction of baseline severity of a target lesion, baseline disease burden of a target vessel, adequacy of PCI and residual disease burden in a target vessel. Therefore, information of the relative increase of FFR in combination with post-PCI FFR would be helpful to discriminate the relative contribution of stented and non-stented segment disease burden and would enable better discrimination of high risk patients after stent implantation. In this regard, the recent publication from the Influence of Fractional Flow Reserve on the Clinical OutcomEs of PERcutaneouS Coronary Intervention (COE-PESPECTIVE) Registry (NCT01873560) explored the prognostic implication of "Percent FFR Increase" after PCI for 2 years clinical outcomes. In that study, when patients were divided using the optimal cut-off values of post-PCI FFR (<0.84) and percent FFR increase (≤15%), patients with low post-PCI FFR showed a higher risk of 2-year target vessel failure (TVF) than those with high post-PCI FFR (9.1% vs. 2.6%, hazard ratio [HR] 3.367, 95% confidence interval [CI] 1.412-8.025, p=0.006). Similarly, patients with low percent FFR increase also showed a higher risk of 2-year TVF compared to those with high percent FFR increase (9.2% vs. 3.0%, HR 3.613, 95% CI 1.543-8.458, p=0.003). Among the high post-PCI FFR group, there were no significant differences in clinical outcomes according to percent FFR increase. Conversely, among the low post-PCI FFR group, those with low percent FFR increase showed a significantly higher risk of TVF than those with high percent FFR increase (14.3% vs. 4.1%, HR 4.334, 95% CI 1.205-15.594, p=0.025). The above results well-explain the theoretical explanations of differential physiologic responses after PCI, according to distribution and relative contributions from predominantly focal or diffuse disease **(Figure 6)**. The clinical implications from post-PCI FFR and percent FFR increase might be as follows. When post-PCI FFR is low, the potential cause can be investigated by pressure pullback recording. In cases of significant pressure step-up at the stented segment, additional procedure with or without intravascular imaging would increase the FFR value. If post-PCI FFR still remains low, but %FFR increase is high enough, it can be considered that the physiologic gain from stent implantation is sufficiently achieved. However, if both post-PCI FFR and %FFR increase are low, the presence of diffuse atherosclerosis needs to be considered. In this case, the benefit of additional local treatment would be limited and meticulous secondary prevention and close follow-up are warranted.

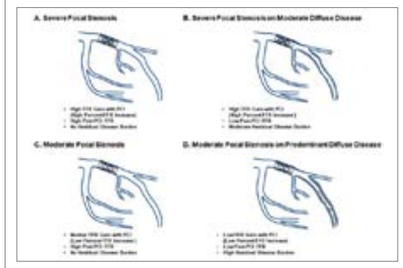

Figure 6. Differential physiologic response after PCI according to disease patterns

TCTAP Workshops
Imaging & Physiology
›› Saturday, April 27, 10:30 AM – 12:30 PM
›› Presentation Theater 1, Level 1

TCTAP Workshops

Left Main and Bifurcation PCI

David Paul Taggart, MD
University of Oxford, UK

Tullio Palmerini, MD
University of Bologna, Italy

Among various anatomical subtypes of atherosclerotic coronary artery disease (CAD), the optimal choice of revascularization strategies is more crucial for patients with diseases of the left main coronary artery (LMCA). The current US and European guidelines recommend that most patients with LMCA disease or microvascular disease (MVD) undergo coronary artery bypass graft (CABG). However, the most updated evidence supports that percutaneous coronary intervention (PCI) is a safe and effective modality for patients with LMCA disease or with low-to-intermediate anatomical complexity as compared with CABG, although some trial shows conflicting results supporting better treatment effect with CABG over PCI.

During TCTAP workshops, **Dr. David P. Taggart of University of Oxford presented a lecture titled 'Why Late Benefit of CABG Is Evident over Time?: Insights from FREEDOM, EXCEL, MAINCOMPARE, and More'.** He reviewed several randomized trials, as well as large scale propensity matched registries. The following summarize the three important reasons that, acting together, explain the progressive survival benefit of CABG.

1. Placing bypass grafts to mid-coronary vessels means that the complexity of the proximal coronary lesion is irrelevant and that bypass grafts remain effective even with eventual progression of predominantly proximal coronary artery. In contrast stents are best when there is localized proximal disease but progression of native disease either proximal to, within, or distal to a stent eliminates the benefit of the stent.

2. It was demonstrated, more than three decades ago, that the internal thoracic artery elutes vasoactive protective agents, including nitric oxide, into the distal coronary circulation whereby slowing the progress of disease. In contrast drug eluting stents stents impair endothelialization and can promote downstream endothelial dysfunction.

3. It has been repeatedly demonstrated that because of technical difficulties, PCI often leads to incomplete revascularisation that is a consistent predictor of subsequent increased mortality and major adverse cardiac and cerebrovascular events (MACCE). In contrast incomplete revascularization is much less likely in patients undergoing CABG where it would be very unusual for the surgeon not to graft an important coronary artery with significant disease subtending a large area of myocardium.

It is these three reasons that explain why despite significant improvements in stent technology over the last two decades CABG continues to have a survival benefit that continues to accelerate with time. Looking at the better long-term outcomes of CABG over PCI, we can focus on the patients selection that will benefit receiving PCI.

There have been several trials for left main (LM) revascularization. **Dr. Tullio Palmerini of University of Bologna prepared a lecture on 'Updated RCT Long-term Data and Meta-analyses for LM Revascularization'.** The 4-year data of the EXCEL trial have been recently presented at Transcatheter Cardiovascular Therapeutics (TCT) (San Diego, September 2018). Rates of the primary endpoint were 18.6% with PCI versus 16.7% with CABG (hazard ratio [HR]=1.10, 95% confidence interval [CI] 0.88-1.36). Although this difference was not statistically significant, the absolute difference in the primary endpoint between the two strategies of revascularization more than doubled from 3 to 4 year of follow up (absolute difference between PCI versus CABG=0.7% at 3 years versus 1.9% at 4 years), warranting longer clinical observation before establishing the relative safety and efficacy of PCI versus CABG. These results were consistent in numerous examined subgroups, including patients with diabetes and higher SYNTAX scores. Of not all cause mortality was significantly higher with PCI compared to CABG (HR=1.39, 95% CI 1.02-1.89), but this difference was mainly driven by non-cardiac mortality (5.3% versus 3.3%, HR=1.61, 95% CI 1.01-2.56), and therefore, likely ascribable to the play of chance.

Following EXCEL and NOBLE trials, at least 18 meta-analyses comparing CABG versus PCI for the treatment of unprotected left main coronary artery disease (ULMCAD) have been performed, with more than 4,000 patients randomized. All these meta-analyses were concordant in showing no significant difference in the rates of death, myocardial infarction (MI), or stroke between the two strategies of revascularization, but increased rates of unplanned revascularization with PCI compared with CABG. In addition, Dr. Palmerini and colleagues reported a significant interaction between the SYNTAX score and the strategy of revascularization for the risk of cardiac mortality, such that compared to CABG, PCI was associated with lower rates of cardiac mortality in patients in the lower or intermediate tertile of SYNTAX score and higher rates of cardiac mortality in those in the upper tertile. In addition, there was a significant interaction between time of follow-up and the strategy of revascularization for the composite of death, MI, or stroke such that event rates were lower within the first 30 days and higher from 30 days onward with PCI versus CABG. Similar results were apparent when considering MI and stroke as individual endpoints.

The most recent meta-analysis included patient level data of 11,518 patients with multivessel coronary artery disease or ULMCAD from 11 randomized trials. At 5-year follow up mortality was 11.2% after PCI and 9.2 after CABG (HR=1.20, 95% CI 1.06–1.37). However, the difference in mortality between PCI versus CABG was significant only in patients with multivessel coronary artery disease (HR=1.28, 95% CI 1.09–1.49), whereas no significant difference was apparent between the two strategies of revascularization in patients with ULMCAD (HR=1.07, 95% CI 0.87–1.33).

He summarized current evidence suggesting similar rates of death, MI or stroke between PCI and CABG for the treatment of ULMCAD, but higher rates of unplanned revascularization with PCI. However, there is an interaction between time of follow up and the strategy of revascularization such that PCI performs better than CABG within the first month, but worse in the subsequent follow up, with equipoise of results between the two strategies of revascularizations at 3 years, but with a trend in favour of CABG at longer-term follow up, which deserves further investigation.

Bifurcation PCI is one of the another main issue in cardiology intervention, in terms of technical challenging and clinical outcomes. **Dr. Bon-Kwon Koo of Seoul-National University Hospital provided an useful lecture of 'Practical Bifurcation PCI with**

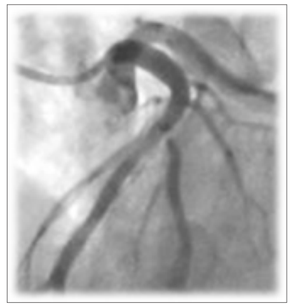

Figure 1. Angiographic evaluation for jailed side branch

Continued on page 8

Left Main and Bifurcation PCI

Continued from page 6

Bon-Kwon Koo, MD
Seoul National University Hospital, Korea

Key Physiologic Concept: Look at the Forest than the Trees'.

Focusing on jailed side branch during procedure, he emphasized that it is important for operator assessing how big myocardial territory of jailed side branch **(Figure 1)**.

There have been several published data on fractional flow reserve (FFR) of jailed side. Dr. Koo introduced these data and the concept of identification of clinically relevant side branch, including the SNUH score, which is a scoring system for diagonal branches **(Table 1)**. From his published data, we can gain perception of the importance of large myocardial territory of side branch, not severity of side branch. With this concept, operators would be help for decision-making of revascularization strategy of jailed side branches in daily practice.

TCTAP Workshops
Left Main and Bifurcation PCI
›› Saturday, April 27, 2:00 PM - 3:30 PM
›› Presentation Theater 1, Level 1

Variables	Description	Score
Size (S)	Vessel diameter ≥ 2.5mm	1
Number (Nu)	Number of diagonal branches ≤ 2	1
Highest (H)	No branch below the target branch	1

Table 1. PCI stabilizes lesion at short-term cost but long-term benefit

22nd KCTA Symposium

This year, TCTAP KCTA symposium celebrated its 22nd year and was held on April 27th at Coronary Theater, Level 1.

This year's TCTAP 2019 KCTA symposium was focused on the latest findings and related theories, and cases on coronary bifurcation lesion, endovascular treatment option and TAVAR, and complex PCI for nurses and technologists working in the cardiovascular field.

Part I: In 'Featured Lecture I' was focused on the procedures and examinations using snoop box, one of recent hot topic among transradial approach sites, such as device, anatomy, puncture method, and postoperative bleeding control. Also, it was an opportunity to find out the latest knowledge and characteristics on the treatment option and device related to coronary bifurcation lesion and peripheral arterial disease (PAD).

Part II: At KCTA International Joint Symposium, six speakers from Korea, Japan, USA and China were invited to present and discuss on the topics of imaging guided PCI, core lab work, and role of comedical staffs in CATH lab. The annual international Joint Symposium was an excellent opportunity to share the experiences of each country and to promote academic development and exchange of each society.

Part III: During Learn the Technique from Case session, common complex PCI, PTA, and TAVAR cases were presented to discuss and share experiences on treatment strategy, procedural tip and tricks.

In addition to the KCTA sessions, continuing education for radiologic technologists was held on April 27th. Meanwhile, the continuing education for nurses will be held on April 29th. Nurses and radiologic technologists working in the cardiac intervention field will obtain continuing education points for their attendendance and participation these sessions. We extend our gratitude to TCTAP secretariat, Korean Nurses Association and Seoul Radiological Technologists Association for their support.

For TCTAP 2019 KCTA symposium, 10 points of KCTA continuing education points will be awarded.

For continuing education for nurses and radiological technologists, 8 and 2 points, respectively, will be awarded.

With the participation of many nurses and technologists, we hope this session will be an opportunity for exchanging and discussing knowledge and experience.

22nd KCTA Symposium
›› Saturday, April 27, 12:00 PM - 4:00 PM
›› Coronary Theater 1, Level 1

TCTAP Workshops

Complex PCI: Make It Simple

James Flaherty, MD
Northwestern University & Bluhm Cardiovascular Institute, USA

Complete vs. Culprit Only Revascularization: What to Do and When?

In patients undergoing percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG), complete revascularization (CR) is associated with better long-term outcomes. This finding has been proven by many studies. Large meta-analysis showed incomplete revascularization was more common after PCI than after CABG. In addition, CR was associated with lower long-term mortality (risk ratio [RR]: 0.71, 95% confidence interval [CI]: 0.65 to 0.77; p<0.001), myocardial infarction (MI) (RR: 0.78, 95% CI: 0.68 to 0.90; p=0.001), and repeat revascularization (RR: 0.74, 95% CI: 0.65 to 0.83; p<0.001) compared with incomplete revascularization. In PCI cohort, higher baseline SYNTAX score correlated with more incomplete revascularization. In this degree of incomplete revascularization (IR) proportionally associated with adverse outcomes. Degree of IR associated with worse survival in patients with low, intermediate and high baseline SYNTAX scores. The DEFINE trial showed that assessed the level of residual ischemia found in patients after PCI. This study found that 1 in 4 patients (24%) treated with standard of care PCI left the cathroom with residual ischemia (iFR <0.90), as demonstrated by using a blinded iFR pullback measurement. This finding showed PCI has limitations for identifying the locations of physiologically significant arterial lesions in patients suffering from coronary artery disease (CAD). Of the patients with residual ischemia, the study showed that 81.6% of those patients had an untreated focal stenosis.

Complete revascularization is associated with better clinical outcome compared with incomplete revascularization in acute coronary syndrome (ACS). There were 4 RCT which compared complete revascularization and incomplete revascularization in STEMI. The PRAMI trial showed preventive PCI associated with better clinical outcome than no further PCI (8.97% vs 22.94%). This finding was similar with CvLPRIT trial. The Acute-Compare trial showed fractional flow reserve (FFR)-guided complete revascularization in STEMI patients associated with better clinical outcome than infarct-artery only treatment (7.8% vs 20.5%). The DNAMI-3 PRIMULTI trial showed similar result. And, there are two ongoing trials in FFR guided completer revascularization in myocardial infarction: COMPLETE trial and FULL REVASC trial.

The impact and timing of CR in STEMI and cardiogenic shock has been less clear. The CULPRIT-SHOCK trial showed multivessel PCI associated with higher adverse outcome than culprit-lesion only PCI in acute myocardial infarction and cardiogenic shock (55.4% vs 45.9%). At 1 year, death had occurred in 172 of 344 patients (50.0%) in the culprit-lesion-only PCI group and in 194 of 341 patients (56.9%) in the multivessel PCI group (RR, 0.88; 95% CI, 0.76 to 1.01). The rate of recurrent infarction was 1.7% with culprit-lesion-only PCI and 2.1% with multivessel PCI (RR, 0.85; 95% CI, 0.29 to 2.50), and the rate of a composite of death or recurrent infarction was 50.9% and 58.4%, respectively (RR, 0.87; 95% CI, 0.76 to 1.00). But limitations of this trial were no functional assessment of non-culprit lesion in multivessel PCI group and high rate of chronic total occlusion lesion. FFR/iFR-guided PCI of non-culprit lesions is a validated and "appropriate" strategy in ACS patients (more well-studied in STEMI).

TCTAP Workshops
Complex PCI: Make It Simple
›› Saturday, April 27, 3:30 PM - 5:00 PM
›› Presentation Theater 1, Level 1

Inside TCTAP 2019; TCTAP, Where Access to Constant Challenges and Enthusiasm for Educational Goals is Possible

Continued from page 1

TCTAP's Core Session; Coronary, Endovascular, Structural Heart Disease Symposia, and Master the CTO

In each session, distinguished experts will give their opinion, in-depth insight and technical tips & tricks through lectures and live case demonstrations. It offers the best approach to understand the recent development and the most valuable opportunities to broaden your horizons on Coronary, Endovascular, CTO and Structural Heart Disease.

ACT Alumni - ACT HOMECOMING 2019 Celebrating 10 Years of ACT!

ACT alumni will be held on April 27th to celebrate the 10th anniversary of the cardiac intervention education program of Asan Medical Center. During the past decade, more than 1,700 young interventionists from 35 countries have participated in the ACT Program, and they continued to keep in touch with the experts.

Expanded TCTAP Training Center

The training center is to hold a total of 15 sessions in Open Studio for 3 days. We expect that participants will be able to take part in various hands-on trainings in small groups led by global experts.

TCTAP Workshops and Hot topics

This course provides lectures and discussions by leading experts from all over the world to share the latest techniques and address cutting-edge issues related to Left Main, Bifurcation, MVD & CTO PCI, Complex PCI, Imaging & Physiology, DES, BRS, DCB, Antithrombotics, Valves, Endovascular, Renal Denervation and LAA Closure.

Main Arena
Opening of TCTAP 2019
›› Sunday, April 28, 9:40 AM – 10:15 AM
›› Main Arena, Level 3

Heart Keeper 2019 Event

Celebrating our 10th anniversary of opening the heart institute, we will be hosting the 10th Heart Keeper event.

The Heart Keeper 2019 event will be co-hosted with Seoul Asan Heart Institute to raise public awareness on the treatment and prevention of cardiovascular disorders. Join us for informative talk concerts and special performance.

• Sunday, April 28, 2:00 PM – 4:30 PM
• Main Arena, Level 3

* Session in Korean

Time	Session
14:00 PM	Opening
14:05 PM	Congratulatory video: Support from the medical staff
14:20 PM	**Session 1: Healthy heart, healthy life**
15:10 PM	Talent donation: Pansori performance
15:30 PM	**Session 2: Doing it right! Heart health rules**
16:20 PM	Closing

TCTAP Workshops

Valves

Davide Capodanno, MD
AOU "Policlinico-Vittorio Emanuele", University of Catania, Italy

David J. Cohen, MD
Saint Luke's Mid America Heart Institute, USA

Vinayak Bapat, MD
Columbia University Medical Center, USA

Durability of Transcatheter Aortic Valves: An Update

The degeneration of transcatheter and surgical bioprosthetic valve evolves with time, and there are several pitfalls of assessing the durability of bioprosthetic valve. First, majority of patients decease over time, therefore, the sufficient number is not available to demonstrate proper valve durability after long-term follow-up. And death exerts a competing risk against the risk of a valve to fail; the result from typical assumption of non-informative censoring patient's death is false. Second, there are more than 20 definitions of structural valve deterioration (SVD) since 2006. Recently, EAPCI/ESC/EACTS proposed a new standardized definition of bioprosthetic valve dysfunction, which comprised SVD, nonstructural valve dysfunction, thrombosis, and endocarditis. In this definition, severe SVD of aortic valve prosthesis was defined as mean gradient >40 mmHg, >20 mmHg change from baseline, or severe intraprosthetic aortic regurgitation (AR), new or worsening (<2+/4+) from baseline. According to this new definition, SVD and bioprosthetic valve failure (BVF) rates were 0 to 6% and 1 to 8% from several studies at a follow-up of 5 to 8 years, not showing safety concerns in comparison with historical surgical aortic valve replacement (SAVR) data, and no difference in severe SVD or BVF at 6 years between transcatheter aortic valve implantation (TAVI) and SAVR was shown in low risk patients from the NOTION trial **(Figure 1)**. Because what really matters is durability beyond 10 years, more meaningful durability data for TAVI are expected no sooner than 2020 to 2025.

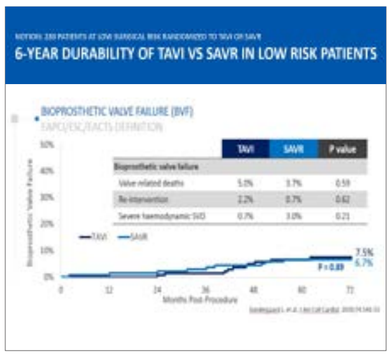

Figure 1. NOTION trial: 6-year durability of TAVI vs. SAVR in low risk patients

Failing Bioprosthetic Valves: Valve Fracture, Basilica, and Others

Recent studies have demonstrated the safety and efficacy of valve-in-valve transcatheter aortic valve replacement (VIV TAVR) as an alternative to reoperation for failed bioprosthetic surgical valves (BSVs). This has led to the approval of VIV TAVR, with both self-expanding and balloon-expandable prostheses, by the US FDA for patients with failed aortic bioprosthesis and who are at high risk of complications related to reoperation. With this approval, VIV TAVR is increasingly used to treat such patients, both in the US and worldwide.

Despite its increasing use and generally safe and predictable results, VIV TAVR poses several important challenges. First and foremost, VIV TAVR may be limited by high rates of patient-prosthesis mismatch (PPM) — particularly when used to treat smaller surgical valves. The incidence of severe PPM (defined as a mean gradient >20 mmHg) following VIV TAVR is reported to be as high as 32%. The risk of PPM is higher in VIV TAVR because the expansion of the transcatehter heart valve (THV) is constrained by the BSV sewing ring. One approach to reducing PPM after VIV TAVR is bioprosthetic valve fracture (BVF) — a method in which the surgical valve ring is fractured with a high-pressure balloon inflation. Typically, this approach results in an increase in the diameter of the surgical valve by 3-4 mm. The other challenge posed by VIV TAVR is acute or subacute coronary occlusion. This complication, which has been reported with native TAVR as well, occurs in approximately 2% of patients undergoing VIV TAVR (and 3.9% of patients whose valve failure mode is stenosis). One approach to reducing this risk of coronary occlusion is coronary protection with prophylactic positioning of an undeployed stent distal to the coronary ostium. In case of coronary occlusion after TAVR, the stent can be retracted to the coronary ostium and deployed. To overcome some of these limitations, the newest approach to prevent coronary obstruction during VIV TAVR is the bioprosthetic or native aortic scallop intentional laceration to prevent coronary obstruction (BASILICA) procedure. In this procedure, a stiff coronary guidewire is electrified and passed directly through the valve leaflet that is overlying the coronary ostium. The wire is then snared in the left ventricular outflow tract (LVOT) and again electrified in order to "slice" the valve leaflet down the centerline. By eliminating the bioprosthetic valve leaflet as a potential cause of coronary obstruction, BASILICA thus provides a path for maintaining coronary patency after VIV TAVR. Although technically challenging, this approach has now been performed in more than 70 patients worldwide including a 30-patient US IDE study, demonstrating 93% technical/procedural success and 3% in-hospital mortality. A longer term follow-up of these patients is ongoing including studies to determine whether this promising approach can alter post-TAVR flow characteristics so as to reduce the risk of leaflet thrombosis.

Mitral VIV Procedures - Planning and Pitfalls

Use of Sapien 3 transcatheter valve has recently been approved for valve-in-valve (VIV) use in high risk patients with bioprosthetic valve failure. The procedure itself demands different skills compared to aortic VIV procedures and understanding of deployment in proper position to get best hemodynamic outcome.

Few critical areas which are important are:

1. Bioprosthetic valve type: Mitral surgical heart valves (SHV) are all stented and fluoroscopically look similar to the aortic counterparts. Leaflets can be bovine pericardial or porcine leaflets **(Figure 2)**.

2. Bioprosthetic valve size: Label sizes range from 25 to 33-35 label size. It is important to find out the label size as it then one can find out what the true internal diameter (ID) is.

3. Sapien 3 valve size and risk of embolization: There is a risk of embolization if Sapien 3 valve used is small. It has been now well-documented that flare in the distal portion of Sapien 3 is critical to avoid embolization.

4. Risk of Left ventricular outflow tract obstruction (LVOTO): Once Sapien 3 valve is implanted within the bioprosthetic valve, it essentially becomes a covered stent, and hence, depending on the aorto-mitral-annular angle, left ventricular size and septal bulge can lead to fixed LVOTO.

5. Technical considerations and approach: Experience in transseptal puncture is essential. Septal puncture in the posteroinferior aspect of the fossa, 3-4 cm from mitral valve is ideal.

6. Anticoagulation and follow up: It is common practice to anticoagulated for at least 3 months. Further, use of NOVAC is not uncommon, although not yet scientifically studied.

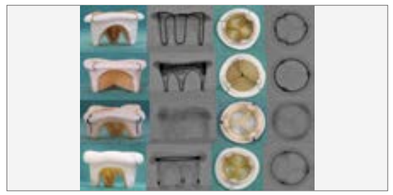

Figure 2. Mitral valve collage

TCTAP Workshops
Valves
›› Saturday, April 27, 5:00 PM – 6:10 PM
›› Presentation Theater 1, Level 1

Hot Topics

Renal Denervation & LAA Closure

David E. Kandzari, MD
Piedmont Heart Institute, USA

Renal Sympathetic Denervation: Back to Life?

Renal denervation (RDN) could be a new treatment approach for patients with treatment-resistant hypertension. In early, non-blinded studies, the treatment appeared to reduce systolic blood pressure (BP) by as much as 30 mmHg. However, SYMPLICITY HTN-3 trial, which included a sham control and ambulatory blood pressure measurement, failed to show significant blood pressure lowering effect of RDN. The result of SYMPLICITY HTN-3 was discouraging but did not end the interest in RDN. SPYRAL HTN-ON MED and RADIANCE-HTN SOLO trial are bringing new hope into the RDN field.

SPYRAL HTN-ON MED, reported by David E. Kandzari and colleagues, is a randomized, sham-controlled trial of catheter-based radiofrequency RDN with Simplicity Spyral™ multi-electrode catheter. The investigators noted that on average RDN had a BP lowering effect in patients with uncontrolled hypertension who were on antihypertensive medication. Office and 24 h ambulatory BP decreased significantly from baseline to 6 months in the RDN group (24 h systolic blood pressure -7.0 mmHg, 95% CI -12.0 to -2.1, p=0.0059; 24 h diastolic BP -4.3 mmHg, -7.8 to -0.8, p=0.0174; office systolic BP -6.6 mmHg, -12.4 to -0.9, p=0.0250; and office diastolic BP -4.2 mm Hg, -7.7 to -0.7, p=0.0190). The change in BP was significantly greater at 6 months in the RDN group (n=38) than in the sham-control group (n=42) for office systolic BP (difference -6.8 mmHg, 95% CI -12.5 to -1.1, p=0.0205). There were no major safety events across studies regarding the Symplicity Spyral™ despite a more complete denervation procedure that includes extension into renal artery branch vessels. The effect of the RDN on BP was similar to that in unmedicated patients in SPYRAL HTN-OFF MED trial.

RADIANCE-HTN SOLO, reported by Michel Azizi and colleagues, investigated whether RDN achieved by endovascular delivery of ultrasound reduced BP in patients with hypertension who were off antihypertensive drugs. Patients with daytime ambulatory BP greater than 135/85 mmHg and less than 170/105 mmHg after a 4-week discontinuation of one or two antihypertensive drugs were randomly assigned to undergo RDN (n=74) or a sham procedure (n=72). The primary endpoint was change in daytime ambulatory systolic BP at 2 months in the intention-to-treat population. RDN reduced daytime ambulatory systolic BP by 6.3 mmHg (95% CI 3.1 to 9.4) more than did the sham procedure (-8.5 mmHg [SD 9.3] vs. -2.2 mmHg [10.0], p=0.0001).

These trials might be the first true evidence that RDN has real BP lowering effect and open the new era of the RDN. However, it is still important to assess the long-term reproducibility of the effects on BP and safety, which could be directly related with cost-effectiveness. Surprisingly, SPYRAL HTN-ON MED study participants showed high poor drug compliance. Possibly, non or poor adherence is very prevalent in resistant hypertension patients. From this point of view, a single intervention with prolonging effect for hypertensive patients could be a significant advancement. Generally, it is considered that the BP reduction has protective effects on coronary heart disease, stroke, heart failure and all-cause mortality, irrespective of baseline BP or preexisting conditions. The new US BP guideline motivated by increasing awareness of benefit with more intensive BP control. However, whether the BP reduction by RDN also results in cardiovascular morbidity and mortality is remained an issue.

In conclusion, epidemic non-adherence to antihypertensive medications identify the need for non-drug treatment options. Renal denervation result in statistically significant and clinically relevant BP reduction in the RADIANCE-HTN SOLO and SPYRAL studies. These studies bring new optimism into the RDN field.

Hot Topics
Renal Denervation & LAA Closure
›› Sunday, April 28, 4:35 PM – 6:00 PM
›› Presentation Theater 1, Level 1

Hot Topics

Antithrombotics

Dominick J. Angiolillo, MD
University of Florida
College of Medicine, USA

Switching Strategy with Contemporary P2Y$_{12}$ Inhibitor: Escalation and De-escalation

Dual antiplatelet therapy with aspirin and a P2Y$_{12}$ inhibitor is the treatment of choice for the prevention of atherothrombotic events in patients with acute coronary syndromes and for those undergoing percutaneous coronary interventions. The availability of different oral P2Y$_{12}$ inhibitors (clopidogrel, prasugrel, ticagrelor) has enabled physicians to contemplate switching among therapies because of specific clinical scenarios. The recent introduction of an intravenous P2Y$_{12}$ inhibitor (cangrelor) further adds to the multitude of modalities and settings in which switching therapies may occur. In clinical practice, it is not uncommon to switch P2Y$_{12}$ inhibitor, and switching may be attributed to a variety of factors. However, concerns about the safety of switching between these agents have emerged. While clinical data for switching is for the most part lacking, strategies can be derived from mechanisms of action and pharmacodynamic studies. Whether the switch occurs in the acute and chronic setting may also influence strategy due to the relative risk of thromboembolic events. Practice guidelines have not fully elaborated on how to switch therapies, leaving clinicians with limited guidance on when and how to switch therapies when needed. Therefore, the expert consensus document by key leaders from North America and Europe with expertise in basic, translational, and clinical sciences in the field of antiplatelet therapy was developed in 2017.

In particular, switching can occur between the oral agents and an intravenous agent. Moreover, the timing of switching with respect to the index event that led to the initiation of P2Y$_{12}$ inhibitor therapy may also vary. Ultimately, switching may occur between different classes of P2Y$_{12}$ inhibitors, which may have potential implications for the occurrence of drug-drug interaction between the two overlapped agents.

In switching between oral P2Y$_{12}$ inhibitors, there are three strategies, such as escalation, de-escalation and change according to the potency of agents. Escalation from clopidogrel to prasugrel or ticagrelor therapy commonly occurs in patients presenting with an acute coronary syndrome, above all those undergoing percutaneous coronary intervention, who may have been pretreated

Davide Capodanno, MD
AOU "Policlinico-Vittorio Emanuele", University of Catania, Italy

with clopidogrel at the time of clinical presentation. De-escalation from prasugrel or ticagrelor to clopidogrel is utilized as a strategy to reduce long-term bleeding events without a trade-off in ischemic protection. Changes between prasugrel and ticagrelor is utilized for side effect of agents (such as ticagrelor-associated dyspnea) or patient's compliance.

This expert consensus document provides recommendations derived largely from pharmacodynamic and registry data, integrated with an understanding of the pharmacological principles of the agents involved. Ongoing dedicated studies will provide important insights into this topic.

Atrial Fibrillation and ACS/PCI: Chains of RCTs up to AUGUSTUS - Enough Evidence or More?

Dual antiplatelet therapy (DAPT) is superior to oral anticoagulation (OAC) for preventing stent thrombosis in patients undergoing percutaneous coronary intervention (PCI), but OAC is superior to DAPT for preventing cardioembolic events in patients with atrial fibrillation (AF). As such, when it comes to managing a patient with AF undergoing PCI, the combination of DAPT and OAC (commonly referred to as "triple therapy") constitutes the therapeutic option to ensure both coronary and cerebral protection. Yet, fully embracing this strategy is limited in clinical practice by the increased risk of bleeding that is typically associated with stacking of antithrombotic therapies.

Relatively small trials, WOEST (What Is The Optimal Antiplatelet & Anticoagulant Therapy In Patients With Oral Anticoagulation and Coronary Stenting) and ISAR-TRIPLE (Triple Therapy in Patients on Oral Anticoagulation After Drug-Eluting Stent Implantation) trials, suggested discontinuation of 1 antiplatelet agent (preferably aspirin) to be considered 1 to 3 month after PCI. In recent years, the results from PIONEER-AF (A Study Exploring Two Strategies of Rivaroxaban and One of Oral Vitamin K Antagonist in Patients With Atrial Fibrillation Who Undergoing Percutaneous Coronary Intervention), the first trial to assess the safety of non-vitamin K antagonist OAC in combination with different antiplatelet treatment regimen in AF patients undergoing PCI, showed 2 rivaroxaban strategies to perform better than standard triple therapy using a vitamin

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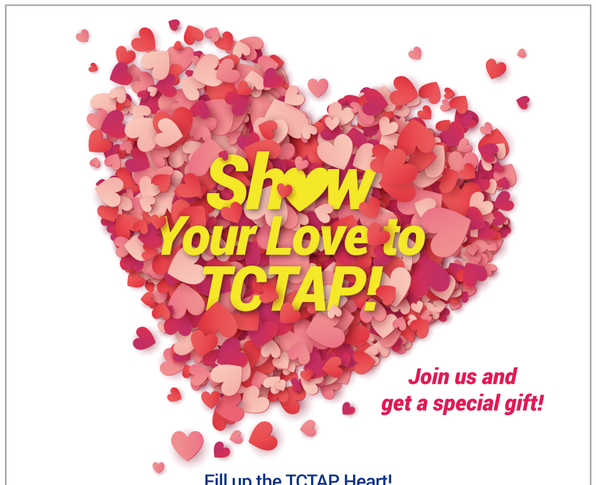


Fill up the TCTAP Heart!
Leave a warm message to show your love and interest in TCTAP.
Your participation will make the heart "Perfect"

CVRF Booth, Grand Ballroom Lobby, Level 1

Saturday, April 27 ——— 8:30 AM ~ 6:30 PM
Sunday, April 28 ~ Tuesday, April 30 — 6:00 AM ~ 6:00 PM

Hot Topics

DES, BRS and DCB

Aloke V. Finn, MD
CVPath Institute, Inc., USA

Contemporary DES: Same or Not - Thromboresistance and DAPT Duration

Despite advances in the design of drug-eluting coronary stents (DES), stent thrombosis (ST) continues to be one of the most feared complications after percutaneous coronary interventions. Without a doubt, the most desired characteristic of DES is intrinsic thromboresistance because it not only minimizes the occurrence of ST but also allows for shortening of dual-antiplatelet therapy.

For biomaterials in contact with blood, it has been proposed that surfaces with high levels of albumin adsorption are desired because albumin could passivate the polymer surface by preventing more reactive proteins, such as fibrinogen/fibrin from adsorbing. DES with fluorinated polymers, which have natural affinity for albumin, have shown in multiple analyses (both clinical and preclinical) to have thromboresistant properties and are ideally suited for short-term dual-antiplatelet therapy (DAPT). Overall, DES with permanent polymer coatings for the most part confer some element of thromboresistance as compared to those that do not have polymer coatings but not to the same extent as fluorinated polymers. Given all DES delay healing compared to BMS and do not demonstrate complete strut coverage by one month (i.e. the most common timepoint chosen for recent short-term DAPT studies), differences in the degree of thromboresistance of different DES probably affect their suitability for this type of approach.

Bioabsorbable polymers, which are becoming increasingly popular, share some degree of thromboresistance but this would be limited to those with circumferential coatings rather than abluminal coatings. It is possible to demonstrate such difference in intrinsic thromboresistance using both animal models (porcine arteriovenous shunt model) and human *in vitro* platelet labeling studies in a flow loop model. Modifications to protocols can also examine the effect of aspirin (or clopidogrel only) in the above studies. This likely is the ideal method to evaluate different stents for short-term DAPT suitability.

Recent STOP DAPT-2 trial examined one month of DAPT followed by either clopidogrel monotherapy or DAPT for 12 months after cobalt-chromium everolimus-eluting stents. Clopidogrel monotherapy was superior to 12 months of DAPT with regard to the primary endpoint of net adverse cardiovascular events and the secondary endpoint of thrombolysis in myocardial infarction (TIMI) major/minor bleeding. Notably greater than 30% of these patient presented with acute coronary syndromes. Other randomized and non-randomized studies are currently underway to examine this same issue.

Different Drug, Polymer, and Platform and So Many Stents - Are There Meaningful Differences?

Tullio Palmerini, MD
University of Bologna, Italy

Establishing whether new drug-eluting coronary stents (DES) with bioabsorbable polymers are superior, similar or inferior in terms of safety and efficacy compared with second-generation DES with permanent polymers remains an issue of paramount importance. Although several randomized trials have been performed to address this issue, they all had a non-inferiority design for the composite endpoint of death, myocardial infarction (MI) and target vessel revascularization, had in general wide non-inferiority margins, and some of them enrolled low-risk patients. All studies performed so far have left undetermined whether there are significant differences in terms of safety and efficacy between these new devices.

Recently, the BIOFLOW trial reported lower rates of the composite of cardiac death, target vessel related MI or ischemia driven target lesion revascularization with the Orsiro stent (Biotronik, Bülach, Switzerland) compared to Xience up to 2 years of follow-up. The safety and efficacy of ultrathin-strut DES is further supported by a recent meta-analysis of 10 trials and 11,658 patients, reporting significantly lower rates of target lesion failure (TLF) and a trend towards lower rates of stent thrombosis with ultra-thin strut DES compared with thicker strut second-generation DES.

However, in the most recent BYONIX trial, not only there was no significant difference in the rates of TLF between Resolute Onyx (Medtronic, Santa Rosa, CA) and Orsiro, there were also significantly higher rates of stent thrombosis with Orsiro compared to Resolute Onyx. Finally, in the last two reported trials, TARGET all comers trial enrolling 1,653 patients and TALENT trial enrolling 1,435 patients, FIREHAWK stent (Shanghai MicroPort Medical Group, Shanghai, China) and the Supraflex stent (SMT, Surat, India) were non-inferior to Xience, respectively. However, in both trials, the non-inferiority margin was again disproportionally high compared to the observed event rate, which resulted lower than expected in both trials. In fact, in the TARGET trial, the expected event rate with Xience was 7%, non-inferiority margin 3.5% and observed event rate 5.9%, whereas in the TALENT trial, the expected event rate with Xience was 8.3%, non-inferiority margin 4% and observed event rate 4.9%.

In conclusion, although there have been many randomized trials comparing different DES each other, they all had a non-inferiority design, which may serve an industry perspective in terms of competition for market share, but does not contribute to iterative advancement of technology. In contrast, more resources should be devoted to test superiority among new DES for a rationale adoption of new devices.

Hot Topics
DES, BRS and DCB
›› Sunday, April 28, 3:10 PM – 4:35 PM
›› Presentation Theater 1, Level 1

Antithrombotics

Continued from page 12

K antagonist plus DAPT.

In RE-DUAL PCI (Randomized Evaluation of Dual Antithrombotic Therapy With Dabigatran vs. Triple Therapy With Warfarin in Patients With Nonvalvular Atrial Fibrillation Undergoing Percutaneous Coronary Intervention) to assess the superiority of bleeding in dual therapy using dabigatran and P2Y$_{12}$ inhibitors compared with triple therapy using vitamin K antagonist in patients with AF undergoing PCI, dual therapy compared with the triple therapy was effective at reducing bleeding events. Also, adverse cardiac events were similar between treatment groups. In AUGUSTUS (Aspirin Placebo in Patients with Atrial Fibrillation and Acute Coronary Syndrome or Percutaneous Coronary Intervention) trial to assess the safety and efficacy of standard-dose apixaban as compared with a vitamin K antagonist and of low-dose aspirin as compared with placebo, on a background of concomitant P2Y$_{12}$ inhibitor therapy for 6 months in patients with AF and recent acute coronary syndrome or PCI, an antithrombotic regimen that included apixaban, without aspirin, resulted in less bleeding and fewer hospitalization without significant differences in ischemic events than regimens that included a vitamin K antagonist, aspirin, or both.

In current European guidelines, triple therapy should be considered for 1 month. However, the North American perspective suggests that triple therapy should be used in-hospital but soon de-escalated to dual therapy with OAC and clopidogrel for 6 to 12 months depending on the bleeding risk, followed by OAC alone in most of cases. Another European perspective suggests that triple therapy should be stopped at discharge, 1 month or 3 to 6 months depending on considerations surrounding the balance between the individual thrombotic and bleeding profile. However, patients with AF undergoing PCI are often at high risk of both ischemia and bleeding; therefore, defining a personalized secondary prevention strategy aimed at achieving the best net clinical benefit is essential. The results of AUGUSTUS trial and upcoming ENTRUST-AF PCI (Edoxaban Treatment Versus Vitamin K Antagonist in Patients With Atrial Fibrillation Undergoing Percutaneous Coronary intervention) trial will likely impact future recommendations and perhaps provide more synergism between North American and European experts who mostly diverge on duration of triple therapy.

Hot Topics
Antithrombotics
›› Sunday, April 28, 2:00 PM - 3:06 PM
›› Presentation Theater 1, Level 1

Yesterday's Highlights

Glorious Best Presenters from Competition Session

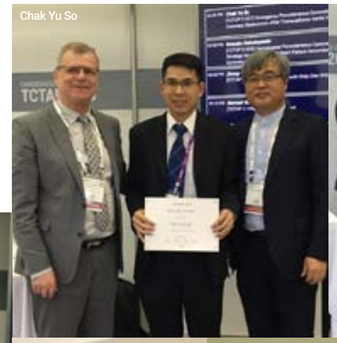
A number of interesting abstracts were submitted from all over the world to TCTAP 2019, and then a few abstracts, and cases were selected to be presented at the Moderated Competition after being strictly reviewed by the scientific committee.

Approximately 84 authors made presentation at the Moderated Abstract, and Case Competition Session and only 15 presenters were selected as the Best Presenters by evaluation.


Benjamin Leo Cheang Leng


Chayan Kumar Singha

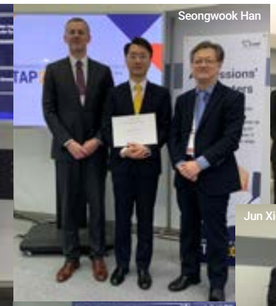

Ching Ju Wu


Chak Yu So

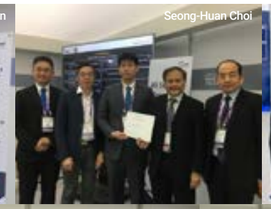

I-Fan Liu


Ashraf Ur Rahman


Deepak Ameta

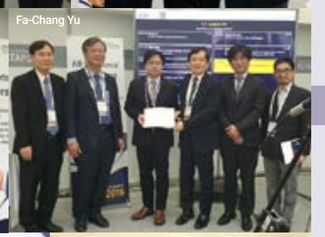

Seongwook Han


Farhat Fouladvand

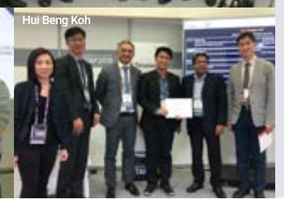

Seong-Huan Choi


Ashraf Ur Rahman


Jun Xie


Fa-Chang Yu


Hsin Ru Li


Hui Beng Koh

Best Abstract Presenters

1-1. Miscellaneous: **Ashraf Ur Rahman** (Bangladesh)
1-2. Miscellaneous: **Seong-Huan Choi** (Korea)
1-3. Acute Coronary Syndromes: **Ashraf Ur Rahman** (Bangladesh)
2-1. Coronary Intervention: **Benjamin Leo Cheang Leng** (Malaysia)
2-2. Acute Coronary Syndromes: **Chayan Kumar Singha** (Bangladesh)
2-3. Miscellaneous: **Seongwook Han** (Korea)

Best Case Presenters

1-1. Complex PCI: **Fa-Chang Yu** (Taiwan)
1-2. Complex PCI: **Hsin Ru Li** (Taiwan)
1-3. Complex PCI: **Deepak Ameta** (India)
2-1. Complex PCI: **Farhat Fouladvand** (Bulgaria)
2-2. Complex PCI: **I-Fan Liu** (Taiwan)
2-3. Complex PCI: **Chak Yu So** (Hong Kong, China)
3-1. Complex PCI: **Jun Xie** (China)
3-2. Complex PCI: **Hui Beng Koh** (Malaysia)
3-3. Complex PCI: **Ching Ju Wu** (Taiwan)

Moderated Abstract & Case Competition

Abstract & Case

Acute and Mid-term Results of Drug-coated Balloon Following Rotational Atherectomy

Taito Nagai, MD
Kyoto Katsura Hospital, Japan

Drug coated balloon (DCB) for small vessel lesion has shown very low target lesion revascularization (TLR) rate of 2.9-6.8%. It is unknown that DCB following rotational atherectomy (RA) has a possibility of stent-less strategy in calcified lesions. Yesterday afternoon, Dr. Taito Nagai from Kyoto Katsura Hospital, Japan, presented their analysis of acute and mid-term clinical outcome of stent-less percutaneous coronary intervention (PCI) with DCB following RA in calcified lesions. From October 2014 to June 2018, consecutive 2,424 cases of 3,644 lesions were treated with PCI in their center. RA was used in 12.3% lesions. In the case of RA, DCB was used in 42.3%. Mid-term follow up evaluations were scheduled at 6 months after PCI. Major adverse cardiovascular events (MACE) was defined as death, myocardial infarction, and TLR. Mid-term follow up evaluations were scheduled at 6 months after PCI. Major adverse cardiovascular events (MACE) was defined as death, myocardial infarction, and TLR. In-hospital MACE was seen in one case of NQMI. During the mid-term clinical follow-up period (196±37 days after initial PCI procedure), there was no cardiac death, and TLR rate was 16.4%. Eligible mid-term follow up angiograms were obtained in 73% (median follow-up duration was 199±61 days after the initial procedure). The angiographic restenosis was observed in 17.8%, and late lumen enlargement was seen in 40% lesions. Dr. Taito Nagai concluded, "Results showed acceptable TLR rate of 16.4% and only one case of in-hospital MACE. This stent-less strategy is going to be a new option for complex calcified lesions".

Moderated Abstract Competition II
2-1. Coronary Intervention
›› Saturday, April 27, 2:00 PM - 2:10 PM
›› Abstract Zone II, Level 1

Self-expansible Bifurcation Stent in LAD and D1 Bifurcation Lesion: Two-year OCT Follow-up

Dedicated strategy with an AXXESS bifurcation stent can simplify complex bifurcation intervention with less metal at carina. Yesterday afternoon, Dr. Fa-Chang Yu from Mackay Memorial Hospital, Taiwan, introduced a case of self-expansible bifurcation stent failure.

A 73 y/o man had hypertension and hyperlipidemia under regular medical treatment. He had intermittent effort chest pain and visited cardiologist's clinic where

Fa-Chang Yu, MD
Mackay Memorial Hospital, Taiwan

myocardial perfusion scan was done. Severe myocardial ischemia, over 40% of the left ventricle (LV), in the anterior and septal wall of LV was found. CAG showed a dominant right coronary artery (RCA) without significant stenosis, but a critical lesion at m-LAD, which was functional total occlusion. The collateral flow was formed posterior descending artery (PDA) of RCA to d-LAD. It's a true bifurcation consisted of m-LAD and diagonal branch (Medina 1, 1, 1). The OM1 of left circumflex artery (LCX) was nearly total occlusion with intracoronary collateral circulation. For a large size of the diagonal branch, they chose the two-stent strategy and deploy a self-expansible bifurcation stent (AXXESS) with another two drug-eluting stents (DES) in d-LAD and D1 in order to simply procedure and decrease metal mass at carina. One year later, they arranged follow-up CAG, which showed severe in-stent restenosis (ISR) in the proximal diagonal branch. Optical coherence tomography (OCT) showed significant neointima hyperplasia and mal-apposed stent strut between the proximal segment of the D1 stent and AXXESS bifurcation stent. They performed OCT-guided PCI with high-pressure NC balloon dilatation, kissing balloon technique, and also DEB for ISR at D1. One year later, they performed follow-up CAG again, which showed severe ISR in d-LAD and 70% stenosis in the distal stent edge. OCT showed significant neointima hyperplasia and mal-apposed stent strut between the proximal segment of the LAD stent and AXXESS bifurcation stent. The further winging of the self-expansible stent at a lateral wall if bifurcation would be the reason of mal-apposed stent, leading to severe ISR. They performed OCT-guided PCI with high-pressure NC balloon dilatation, kissing balloon technique, DEB for ISR at LAD, and extended DES in d-LAD.

Dr. Fa-Chang Yu noted, "Stent malposition plays a crucial role of early stent failure, including stent thrombosis and ISR. Further winging of self-expansible bifurcation stent at the lateral wall of bifurcation could probably disassembly the downstream-connected stent which might be leading to the mal-apposed stent and also stent failure".

Moderated Complex Case Competition I
1-1. Complex PCI
›› Saturday, April 27, 2019, 2:20 PM - 2:30 PM
›› Case Zone I, Level 1

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