

8TH EDITION

MLCTO

SHARING KNOWLEDGE

MULTI LEVEL CTO
ANNUAL COURSE

JUNE 29TH - 30TH
& JULY 1ST 2023

HIGHLIGHTS

Did you know that all CTO operators can become a member of the ML CTO Academy?

Page 2

Find out what differentiates the ML CTO Academy from other societies with Dr Alexandre Avran.

Page 3

Discover JetCTO & HostiumCTO: the first registries of the ML CTO Academy.

Page 4

"Antegrade Wiring: When it works, when it doesn't" by Dr Alexandre Nap.

Page 6

Review a selection of CTO studies published in 2023.

Page 7

The article on the 7th ML CTO Annual Course by Dr Chadi Ghafari.

Page 9

ML CTO VIDEO LIBRARY EDUCATIONAL OPPORTUNITIES

Access to the ML CTO video library for a wealth of CTO PCI knowledge and retrieve videos from all editions on ADR, antegrade, complications, imaging, retrograde, and much more: +300 videos are available!

ML CTO Members can also submit their cases! The authors of the best-selected cases will be invited to present onstage during the ML CTO Annual Courses.

Page 16

CO-DIRECTORS



Alexandre
AVRAN



Kambis
MASHAYEKHI

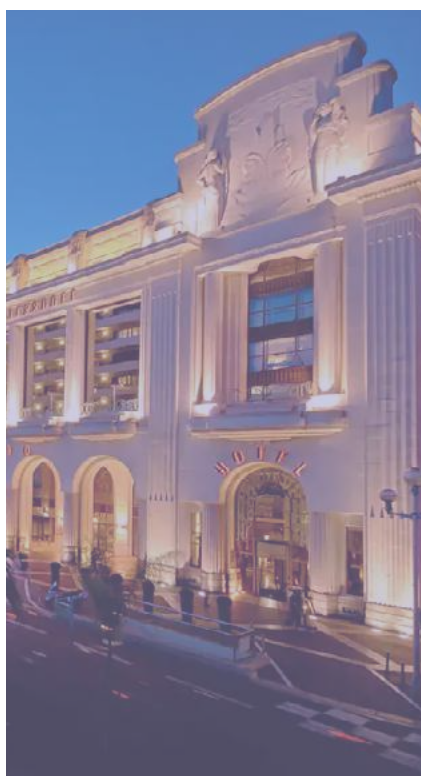


Stéphane
RINFRET



The ML CTO Academy is an educational and scientific association aiming to improve patient care through the support of teaching, science, research, and clinical practice in the field of interventional cardiology, focusing on coronary chronic occlusion treatment.

Page 2



Ultimaster Nagomi
Sirolimus eluting coronary stent system

READY FOR **ACTION.**

NAVIGATE THE COMPLEXITIES OF EVERY PROCEDURE FOR OPTIMAL OUTCOMES FOR/WITH EVERY PATIENT.

TERUMO
INTERVENTIONAL
SYSTEMS

www.terumo-europe.com

Ultimaster Nagomi™ is not available for sale in all countries. Please contact your Terumo local sales representative for more information.

JOIN THE ML CTO ACADEMY!

THE ML CTO ACADEMY IS AN EDUCATIONAL AND SCIENTIFIC ASSOCIATION AIMING TO IMPROVE PATIENT CARE THROUGH THE SUPPORT OF TEACHING, SCIENCE, RESEARCH, AND CLINICAL PRACTICE IN THE FIELD OF INTERVENTIONAL CARDIOLOGY, FOCUSING ON CORONARY CHRONIC OCCLUSION TREATMENT.

MLCTO
ACADEMY
RESEARCH • EDUCATION



As for today, we observe very few thorough studies among the international CTO community, mainly due to the small number of centers included in the process of patient recruitment.

ML CTO ACADEMY has first been created to support innovation and research.

Its main objective is to offer all members the opportunity to participate in their registries, in accordance with their national ethical committees' regulations, and to submit topics, which will be discussed and selected by the Board.

Each member can also participate and include their case data for publication purposes, and/or to present during the ML CTO Courses.

The Academy aims to improve ethical, technical, and material conditions in coronary chronic occlusion treatment to enhance patient care.

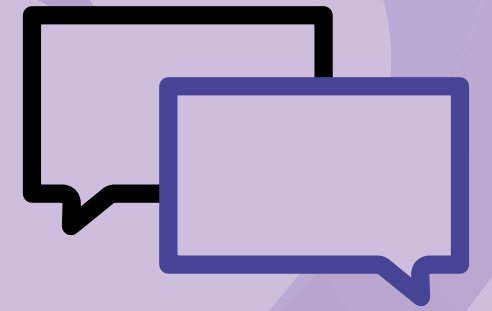
Its mission is also to provide continuing education and training for its members, with an active personal involvement and interest in CTO PCI, and to promote the exchange of ideas, experience, and information for the further direction and goals of this niche treatment.



ALL CTO OPERATORS CAN BECOME A MEMBER OF THE ACADEMY.

- 1. BE PART FOR FREE**
of an international scientific community dedicated to CTO PCI – with information and experience sharing, breaking news, and regular training programs.
- 2. BE ALLOWED TO**
submit scientific studies, related to CTO PCI.
- 3. PARTICIPATE IN ALL REGISTRIES**
organized and supervised by the ML CTO Academy (according to the criteria of national ethical committees).
- 4. HAVE A PRIORITY ACCESS**
to all ML CTO events

INTERVIEW Alexandre Avran



INTERVENTIONAL CARDIOLOGIST
AT THE CENTRE HOSPITALIER DE VALENCIENNES (FRANCE)
CO-FOUNDER OF THE ML CTO ACADEMY

Q. How did the ML CTO Academy come to be? What was the inspiration?

A. The idea of founding the Academy came about because I wanted to build a scientific community of CTO operators. I have been part of the Euro CTO club for 10 years, entering all my cases in its database but the access is limited. Then, we also wanted to develop specific

registries on "small questions", like a niche, but inviting everyone to feed this database, with no restriction on how many cases they are doing per year, their country, etc.

That is why we have now launched the studies! The first of these was Jet CTO, a registry evaluating the clinical and angiographic outcome of covered stents placed on a CTO procedure. The second one is HostiumCTO, a study for the evaluation

of the clinical outcome following ostial RCA CTO procedures. Thanks to this, the truth is that we have brought together many people who want to be part of the ML CTO Academy.

Q. What differentiates the ML CTO Academy from other societies?

A. It is an open-minded society, and it is open to everyone, from beginners to experts. As I said before, there are no restrictions on how many cases you must perform per year... Everyone can enter our database and suggest new study ideas. It is a very interactive society and becoming a member is free!

Q. What is your vision for the ML CTO Annual Course 2023?

A. The prospects for the ML CTO Annual Course 2023 are very good and we have many registrations. But unfortunately, every year we're facing a lack of grants, and this is a big problem for us.

From my point of view, it's one of the best programs we've ever done: interesting live cases and interesting couples of operators. Our idea of picking the couples through a lottery was fantastic and everyone is waiting for this moment.

Q. What compelled you to create the first ML CTO Course?

A. The idea of creating the ML CTO Course came to me after organizing JIF CTO, a small French meeting with 50 participants around live cases and with lots of discussions and interactions.

When I had to organize the JIF CTO meeting in my center, at that time I was working at the Marignane clinic, and I received 150 applications for

50 places!

It was hard for me to make the selection and people told me "I want to participate, I want to learn", and it was in this way that the idea of creating this course arose... Because many people wanted to learn. We divide it into three levels: beginner, intermediate, and expert. And that's how the story began!

Q. Any inspiring moment that you would like to share since the 1st ML CTO Course in 2016?

A. The most inspiring moments since the first edition arise from the friendship that Stephane, Kambis, and I have. We created something that did not exist and that was successful from the first edition.

In this sense, I want to send a very special thanks to Max Amor. I wanted to do the first ML CTO in French, just with French people, but Max told me: "No, if you want to win, you first have to do it in English, internationally." And so we did!

In the first year, we managed to gather around 300 participants. I remember that Dimitri Karpaliotis, one of the founders of the New York CTO Summit, was there. He was very surprised and told me that they had to wait until the fourth edition to get 300 people together.

The following year we were double, then 600 and now 800! However, the number of attendees does not matter to us, the most important thing is to maintain the idea of innovation, interaction and always giving our best. That is why the ML CTO course has become a success.

For Healthcare Professionals Only. Please contact your local Cordis representative for more information. Cordis and Cordis LOGO are trademarks of Cordis and may be registered in the US and/or in other countries.

© 2023 M.A. Med Alliance SA. SOLUTION SLR is a trademark of M.A. Med Alliance SA. SOLUTION SLR - Sirolimus Eluting PTCA & PTA Balloon Catheters - CE Mark Approved. Not available for sale in the United States.

MD CE 0344



DISCOVER THE REGISTRIES OF THE **MLCTO ACADEMY!**

JetCTO Registry

A retrospective, multi-center registry evaluating the clinical and angiographic outcome of covered stents for the treatment of coronary perforation during CTO procedures.

Coronary perforation occurring during a CTO PCI is a rare complication with potential major adverse cardiac events. The long-term clinical and angiographic outcome of such perforation that needs sealing with a covered stent, must be refined in a large international registry. The purpose of this study, sponsored by the University of Mons with an unrestricted educational grant from the ML CTO Academy, is to describe in a large international collaborative network the occurrence and outcome of coronary perforations complicating a CTO procedure.

Primary Endpoint:

To assess the long-term (≥ 6 months) clinical follow-up of patients suffering from a coronary perforation during a CTO procedure.

Secondary Endpoint:

1. Angiographic patency of any covered stent used to seal the perforation;
2. Rate of complications (composite of cardiac death, myocardial infarction, major bleeding and cardiac tamponade) of the index procedure.



HostiumCTO Registry

A retrospective, multi-center registry for the evaluation of the clinical outcome following ostial RCA CTO procedures.

The prevalence of ostial CTO lesion of the RCA is the most prevalent and constitutes an increased challenge during PCI owing to the difficult engagement of the lesion as well as the use of the retrograde approach. The long-term clinical and angiographic outcome of such lesions need to be refined in a large international registry.

Primary Endpoint:

To assess the long-term (>6 months) clinical follow up of patients who underwent a CTO procedure of an ostial RCA.

Secondary Endpoint:

1. Angiographic patency of any stent implanted during the procedure; Rate of complications (composite of cardiac death, myocardial infarction, major bleeding and cardiac tamponade) of the index procedure.



Your dreams. Woven together.

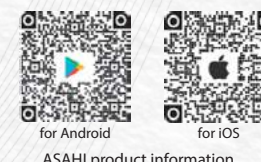
ASAHI INTECC

ASAHI Gladius

MG



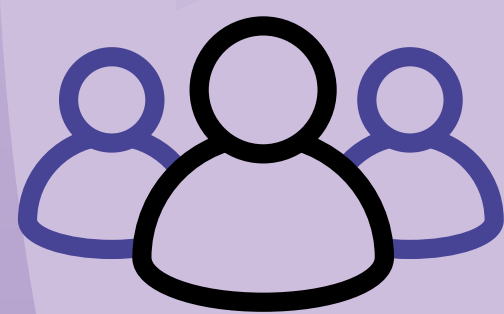
Broaden your Approach to CTO Cases



ASAHI product information

CE 0344

© 2023 ASAHI INTECC CO., LTD.
"ASAHI", "ACT ONE", and "ASAHI Gladius" are trademarks
or registered trademarks of ASAHI INTECC CO., LTD. in Japan and other countries.
Coated with SLIP-COAT™ coating



Speaker FOCUS



DR ALEXANDRE NAP
INTERVENTIONAL CARDIOLOGIST
AMSTERDAM, THE NETHERLANDS

ANTEGRADE WIRING: WHEN IT WORKS, WHEN IT DOESN'T

Antegrade wiring (AW) forms the backbone of PCI CTO and is the most commonly applied strategy for crossing CTO's. AW is a technique that assumes guidewire penetration into the CTO body, intraplaque tracking and distal true lumen entry. The success rate of antegrade wiring differs greatly in unselected cases. However, it is important to understand that to safely achieve a high success rate in CTO PCI, expertise in dissection and re-entry as well as retrograde techniques is mandatory.

Many factors drive antegrade wiring success, but roughly 3 key determinants can be distinguished. Understanding and/or mastering these 3 will bring about the highest antegrade success rate.

CTO anatomy / morphology

The proximal cap morphology highly impacts AW success. A clear tapered cap favors AW whereas a blunt or ambiguous cap has a higher probability of getting extraplaque. Moreover, the length of CTO body dictates whether AW will be successful, longer length favoring extraplaque tracking. Also, both calcification and bending within the CTO body negatively impacts AW success dramatically. These 4 CTO-factors equally contribute to the J-CTO score, a score predictive of probability of successful AW. The lower the J-CTO score, the higher the chance of antegrade success.

Wires and wiring techniques

In recent years significant advances in wire technology have resulted in wires that have better torque transmission, penetration force and wire control. Consequently many different wires are available. A logic wire algorithm has emerged that classifies wires into different categories from low penetration force, to intermediate and high penetration force. Escalating and/or de-escalating in relation to cap morphology and wire position within the CTO body will drive the choice of wires.

Operator skills

Although almost never emphasized and difficult to objectivize wiring skills are extremely important for AW success. Wiring skills can improve with extensive training, implementing knowledge of CTO anatomy, wires and wiring techniques. However, it should not be denied that a (genetic) dexterity highly impacts AW success.



**DISCOVER ALL THE TALKS YOU CAN ENJOY
AND START PLANNING YOUR AGENDA!**
MEET OUR #MLCTO2023 SPEAKERS

REVIEW OF CTO STUDIES

Effectiveness, safety, and patient reported outcomes of a planned investment procedure in higher-risk chronic total occlusion percutaneous coronary intervention: Rationale and design of the invest-CTO study
By Dr Anja Øksnes

Catheter Cardiovasc Interv. 2023 May 17. doi: 10.1002/ccd.30692

Invest-CTO Study

CTO modification after unsuccessful crossing is associated with subsequent higher procedural success, but complication rates remain high. Whether a planned CTO modification ('Investment procedure') could improve patient outcomes has never been investigated.

Invest-CTO is a single-arm, international (Norway and UK), multi-center study, prospectively evaluating the effectiveness and safety of a planned 'Investment procedure', with a subsequent completion procedure at 8-12 weeks, specifically in anatomically high-risk CTOs. We are enrolling 200 patients with high-risk CTOs according to our Invest CTO criteria. The co-primary endpoints are cumulative procedural success and safety after both procedures. Patient-reported outcomes and clinical endpoints will also be reported.

We anticipate that this study might change our perspective on how we approach high-complexity, high-risk CTOs, may make these cases more accessible to less experienced operators, and improve the overall patient therapeutic experience.

Impact of percutaneous intervention compared to pharmaceutical therapy on complex arrhythmias in patients with chronic total coronary occlusion. Rationale and design of the CTO-ARRHYTHMIA study
By Dr Martin Kirk Christensen

Cardiovasc Revasc Med. 2023 Apr 10;S1553-8389(23)00124-0.
doi: 10.1016/j.carrev.2023.04.001

Chronic total coronary occlusions (CTO) occur in up to 50 % of patients with coronary artery disease by angiography. In CTO-patients, clinically significant arrhythmia is potentially important and insufficiently investigated. Therefore, the purpose of the CTO-ARRHYTHMIA study is to investigate the incidence of loop recorder-detected clinically significant arrhythmias and the effect on arrhythmias of revascularization by CTO-PCI.

The study is an ongoing independent sub-study of the NORDIC-Baltic Randomized Registry Study for Evaluation of PCI in Chronic Total Coronary Occlusion (NOBLE-CTO); ClinicalTrials.gov Identifier NCT03392415. NOBLE-CTO prospectively collects procedural data, quality of life measures, echocardiographic and cardiac MRI findings before and after treatment as well as clinical outcomes in all CTO patients that may be treated by PCI.

Periprocedural Mortality in Chronic Total Occlusion Percutaneous Coronary Intervention: Insights From the PROGRESS-CTO Registry
By Dr Bahadır Simsek

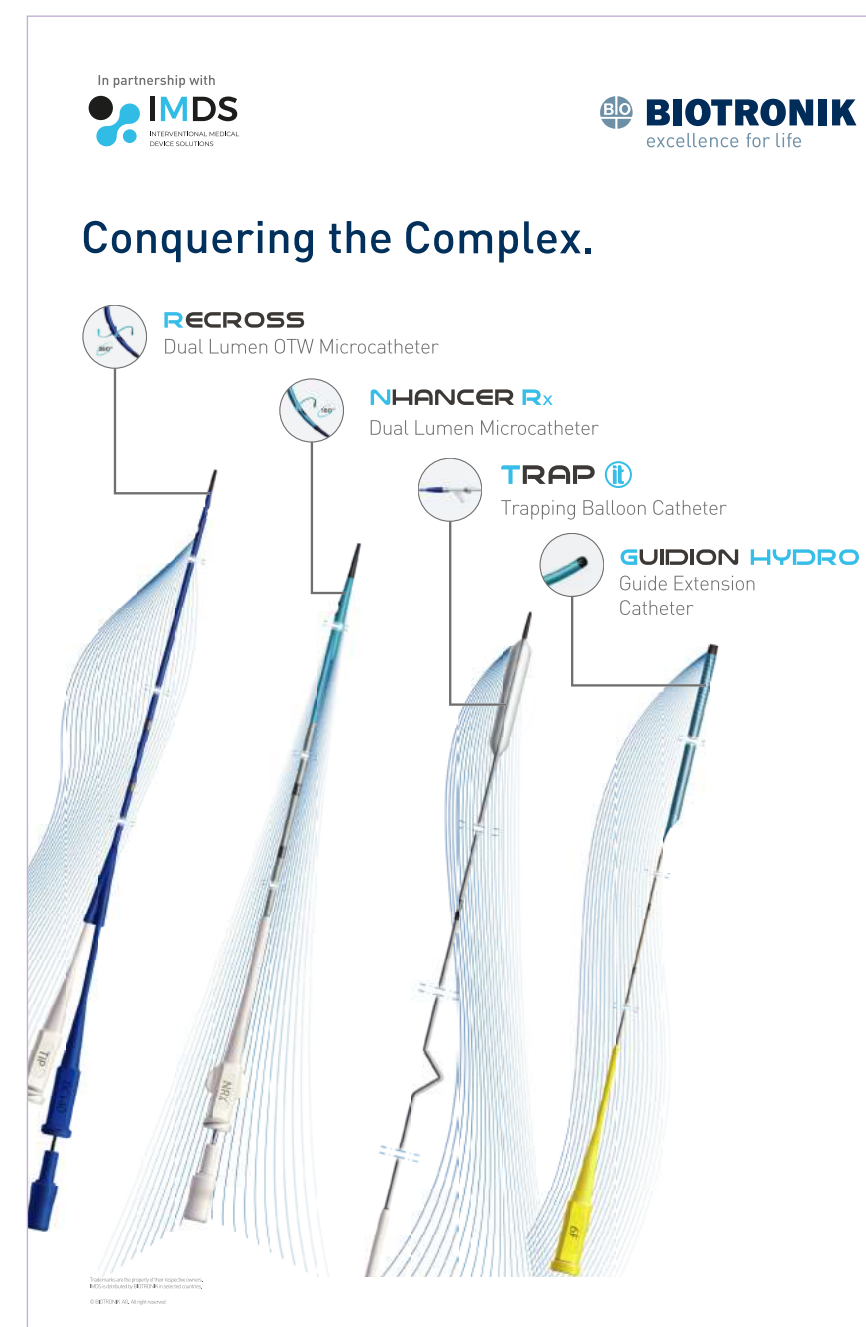
Circ Cardiovasc Interv. 2023 Jun 1;e012977. doi: 10.1161/CIRCINTERVENTIONS.123.012977

Of the 12,928 patients who underwent CTO PCI, 52 (0.4%) died during the index hospitalization. The cause of death was cardiac in 43 (83%) and non-cardiac in 9 (17%). Complications leading to cardiac death were: tamponade in 30 (58%), acute MI in 9 (17.3%), and cardiac arrest/shock in 4 (7.7%). Non-cardiac causes of death were: stroke in 3 (5.8%), renal failure in 2 (3.8%), respiratory distress in 2 (3.8%), and hemorrhagic shock in 2 (3.8%).

Outcomes of Chronic Total Occlusion Percutaneous Coronary Intervention After a Previous Failed Attempt
By Athanasios Rempakos

Am J Cardiol. 2023 Apr 15;193:61-69. doi: 10.1016/j.amjcard.2023.01.045. Epub 2023 Mar 3

Out of 9,560 chronic total occlusion (CTO) percutaneous coronary interventions (PCI) in the PROGRESS-CTO registry, 20% had a prior failed attempt. Reattempt cases had higher lesion complexity, longer procedure times, and lower technical success rates (84.3% vs 86.5%; p=0.011). However, after adjusting for confounders, prior failure was not significantly associated with technical failure. Operators performing more than 30 CTO PCIs annually had a higher likelihood of achieving technical success in prior failure patients.



DOWNLOAD MLCTO APP TO ACCESS #MLCTO2023!

AFTER INSTALLING THE APP, YOU CAN:

- Access the event programme, attendee and speaker list
- Find your way around through the interactive floorplan
- Create your own daily schedule that will guide you through the day
- Stay informed and receive the latest messages and news
- Take part in our social feed
- Chat with other attendees and in topical forums
- Vote, ask questions and take notes during sessions
- Share your information easily with our industrial partners

HOW TO DOWNLOAD:

The easiest way to download our mobile app is to scan one of these barcodes.

You can also search for 'MLCTO' in the Apple App Store or Google Play Store.



JOIN THE CONVERSATION #MLCTO2023



THE 2022 REVIEW

By Dr Chadi Ghafari

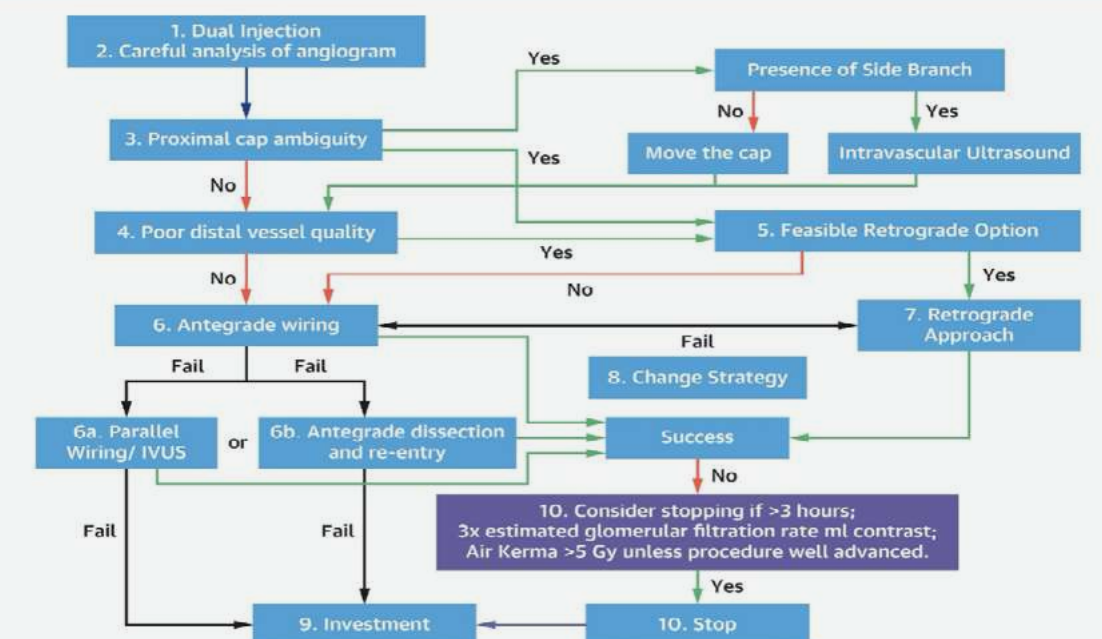
Once again, CTO operators from around the world met in the French Riviera in Nice for the 7th edition of the MLCTO conference on 30 June. Over 500 participants attended to watch the 12 live cases from Nice, Atlanta, Brisbane, Dublin, Taipei and Johannesburg over the course of 3 days. However, MLCTO is never just about the live cases. This year once again, participants were able to take part in discussions and acquire tips and tricks from CTO experts in the friendly and relaxed atmosphere of this conference for professionals at every level of the sector. What's more this year, participants were able to present several of their most interesting clinical cases. As in previous years, the course was a great success! Take a look at the highlights and watch the full video replay on the MLCTO Academy website (<https://academy.mlcto.com>).

Day 1

The course was kicked off by co-directors Alexandre Avran, Kambis Mashayekhi and Stéphane Rinfret with the question "I am an antegrade-only operator: can MLCTO help me improve my skills?" It was back to basics with Emmanouil Brilakis, who reviewed the fundamental principles of CTO and underlined the main purpose of PCI: to improve symptoms, as emphasised in several registries (EuroCTO, ImpactorCTO, COMET CTO, etc.). He underlined the importance of dual injection angiography as well as reviewing angiograms and the 4 key aspects: the proximal cap, the length of the occlusion as well as calcification and tortuosity, the quality of the distal vessel and the presence of collaterals. Brilakis covered the different scores used (J-CTO and PROGRESS-CTO) and the importance of coronary CTs. He presented basic tips and tricks such as using a safety wire in the donor vessel as well as the use of microcatheters. The global CTO algorithm was reviewed as well as the approach to "balloon uncrossable" lesions. The expert emphasised the importance of changing strategy and optimising the vessel while keeping in mind the complications that may arise. The conclusion of his presentation was in synergy with the MLCTO: learn and discuss!

Global chronic total occlusion crossing algorithm presented by E. Brilakis

CENTRAL ILLUSTRATION: The Global Chronic Total Occlusion Crossing Algorithm



Wu, E.B. et al. J Am Coll Cardiol. 2021;78(8):840-853.



Gregor Leidundgut presented the new guidewires and microcatheters available on the market, such as the new Gladius MG (Asahi) which allows for a smaller knuckle (8 mm) that is easier to control. The brand new Warrior guidewire (Teleflex) as well as the Infiltrac and Infiltrac Plus (Abbot) were also highlighted in the penetration wire category. The expert then reviewed the different microcatheters and their differences. He covered the Recross (IMDS), the dual lemun microcatheter as well as the MicroRx Hybrid microcatheter (IMDS) which provides more efficient push and easier guidewire exchange. In conclusion, the expert presented his must-have essentials: The Turnpike Spiral (Teleflex) or Corsair Pro (Asahi) for an antegrade strategy, Turnpike or Corsair Pro 150 cm for retrograde approaches or the Turnpike LP/Corsair Pro XS and finally the Caravel (Asahi) for epicardial collaterals - so one short, one long, and one thin microcatheter.

Luiz Ybarra talked about how to manipulate guidewires using 6 different techniques in videos: puncture using high tip load guidewires (Confinza Pro 12 (Asahi), Hornet 14 (Boston Scientific), Astato (Asahi) and Infiltrac (IMDS)); the “push-deflect-torque” technique using the Gaia and Gaia Next family (Asahi) and Judo (Boston Scientific); drilling (polymer-jacketed or hydrophilic guidewires); guidewire sliding (all guidewires); surfing (Sion and Sion Black (Asahi)) and knuckling (Fielder XT (Asahi), Pilot 200 (Abbot), Gladius MG (Asahi)).

Alexandre Avran presented the parallel wiring technique for the antegrade approach: the first wire enters the subintimal space and is used as a reference/marker to direct a second guidewire. He emphasised the usefulness of the Recross microcatheter (IMDS). He concluded with his tips and tricks: don't try too hard to redirect the subintimal guidewire; the second wire should have at least the same tip load as the first, if not more; always start with your second wire at the proximal cap.

The highlight case of this first session was performed by Andrea Gagnor and Anja Øksnes at Polyclinique Saint Georges in Nice, France. It was a right coronary CTO with a “blunt” and non-ambiguous, long proximal cap and a distal cap at a bifurcation as well as collaterals via the septal. As the initial strategy was an antegrade strategy, the operators used a Fielder XT-R guidewire (Asahi) which penetrated well but unfortunately a Recross microcatheter (IMDS) did not cross even after 2.0 and 2.5 mm balloon dilatation. The operators inserted a Finecross microcatheter (Terumo) and exchanged the Fielder XT-R for a Gaia Second (Asahi). The Gaia Second always took a side branch and did not find the proper path. The operators decided to change their strategy to a retrograde approach. After septal surfing using a Suoh 03 guidewire

(Asahi), followed by a Caravel microcatheter (Asahi) through the mesh of a stent already present at the LAD, the guidewire did not find the right path. The operators changed septal (using the Suoh 03) and found a connection to the posterolateral branch, prepared the ground for an antegrade approach using a Fielder XT-R (Asahi) knuckled guidewire, and punctured the distal cap using a Gaia Next (Asahi) with the retrograde technique, but unfortunately found themselves far from the vessel architecture. This forced them to find a new septal connection again (using the Suoh 03) to the PDA, and try again to perform the retrograde puncture using a Gladius guidewire (Asahi) and then a Gaia Next, Gaia Second and Gaia Third (Asahi), Hornet 14 (Boston Scientific). This was unsuccessful and created a small perforation at the distal cap. The antegrade guidewire was exchanged for a Gladius MG (Asahi) in order to have a smaller loop in a good position and the retrograde puncture was also performed using a Gladius MG. A Guideliner (Teleflex) was inserted using the antegrade technique to facilitate a Reverse-CART but not without difficulties due to the presence of calcifications in the right coronary requiring lithotripsy of the middle part of the right coronary with a 3.0 mm Shockwave balloon. Reverse-CART was performed with a Gladius MG and an RG3 guidewire (Asahi). Finally, they dilated the middle right coronary with the Shockwave balloon and finalised the procedure with the insertion of stents to the PDA for an excellent final result.



CTO-PCI of the right coronary performed by Andrea Gagnor and Anja Øksnes using Reverse-CART

The second session of the day started with a live case from Dublin (Mater Private Hospital) performed by Colm Hanratty and Hafiz Hussein. This was a second attempt at a short CTO of the proximal right coronary, collateralised by an epicardial from the circumflex to the marginal branch as well as some septal perforators to the distal RCA. The proximal cap was clear while the distal cap was located at the bifurcation with the marginal branch. The initial strategy that the operators had proposed was an antegrade strategy. Advancing a Pilot 200 guide (Abbott) and a Mamba Flex (Boston Scientific) microcatheter, the operators found themselves far from the distal cap and exchanged the Pilot 200 guidewire for an Infiltrac guidewire (Abbott) that ended up in the subintimal space. The operators again exchanged their wire for a Gaia 3

(Asahi) in order to redirect it, but it also ended up in the sub-intimal space. They considered a change in strategy for a dissection and re-entry, but unfortunately the Stingray LP (Boston Scientific) did not cross the CTO even after dilatation. The operators exchanged their guidewire for a Fielder XT-R (Asahi) which forms a knuckle and the insertion of a Trapliner (Teleflex) for better support but which remained rather far away. A re-knuckle attempt was made using a Gladius MG (Asahi) providing a good position for a re-entry. The Stingray LP was then positioned after exchanging the Gladius MG for a Miracle 12 (Asahi). Using the “stick and drive” technique, an Infiltrac penetrating guidewire (Abbott) found the distal lumen. They ended the case with IVUS imaging showing the sub-intimal pathway and implanted Xience Skypoint stents (Abbott), seeing the patient in a few weeks for outcome optimisation.



Right coronary CTO-PCI performed by Colm Hanratty and Hafiz Hussein using ADR.

Roberto Garbo emphasised the importance of intracoronary IVUS imaging in CTO PCI by presenting cases where imaging has proven to be essential. He concluded by presenting the role of IVUS for proximal cap puncture, bifurcations, ADR, stent sizing and to avoid antegrade contrast injection as well as treating complications. Thierry Lefèvre talked about how to manage bifurcations in CTO-PCIs. He noted the frequency of bifurcation in 1/3 of CTOs and the loss of side branches (around 50%) while presenting the increased risk of branch loss with ADR, having a sub-intimal path, stenosis of the branch and if the bifurcation is located along the CTO. The impact of this loss is not without complications. Several articles show a 3-fold increase in the risk of heart attack after loss of the side branch. He ended by stressing the importance of protecting these branches, respecting the fractal law and performing the POT.

Stéphane Rinfret presented the 10 commandments for your first ADR: have all the required equipment, have a good landing zone, keep the retrograde option open, have a clear proximal cap, try to prevent hematoma formation, use a good microcatheter, antegrade wiring first and quickly convert to knuckle wire, avoid the use of the CrossBoss, and finally, know the “stick and drive” and “stick and swap” techniques. His tips and tricks included the TrapLiner guide extension catheter (Teleflex) to decrease the spread of a hematoma, as well as the



TurnPike Spiral (Teleflex) and the Mamba Flex microcatheters (Boston Scientific). He emphasised the usefulness of the Stingray LP balloon (Boston Scientific) which allows the stick and drive technique to be used with a healthy landing zone with an Astato 20 (Asahi) or a Hornet 14 (Boston Scientific) or the stick and swap technique in the case of a diseased/compressed landing zone with an Astato 20 exchanged for a Pilot 200 (Abbott) or Gaia (Asahi). He underlined the importance of selecting the right view for re-entry.

Paul Knappen talked about how to manage perforations during CTO-PCIs, which occur in 3% of PCIs and can occur in the main vessel, as a distal wire perforation or collateral perforation and are classified according to Ellis type

Different types of perforations during CTO PCIs presented by Paul Knappen

He outlined the steps to be taken to contain the perforation: inflate a balloon, get intravenous fluids going, if necessary, do pericardiocentesis and notify cardiac surgeons. Treatment includes delivering covered stents, intentional dissection, coils, as well as embolization via fat injection and reversing anticoagulation. Paul Knappen's presentation was complemented by Alexandre Nap's presentation on managing collateral channel perforations with coils or fat, emphasising the importance of treating perforations on both sides of the collateral. He presented the closed-loop balloon-stent technique which involves cutting a balloon, rolling up the distal part and then covering the stent and inserting it.

Collateral perforations presented by Alexandre Nap

Coronary Perforation

Main Vessel perforation, Distal Wire perforation, Collateral perforation

1. Location, 2. Severity

General treatment: 1. Inflate balloon to occlude vessel, 2. Intravenous fluids / vasopressors, 3. Pericardiocentesis if hypotension / autotransfusion, 4. Notify surgeons, 5. Obtain 2nd arterial access

Monitor patient, Treat the cause

Location-specific Treatment: Large vessel perforation (1. Covered stent, 2. Prolonged balloon inflations, 3. Dissection techniques, 4. Coils (CTO)), Distal vessel perforation (1. Embolization (fat, coils, etc), 2. Covered stent over perforated branch origin)

Continued extravasation? Reverse anticoagulation, Surgery

Brilakis | Manual of Chronic Total Occlusion Percutaneous Coronary Interventions; 3rd edition 2022

Bypass graft, Septal, Epicardial

Tortuosity	+	++	+++
Perforation risk	+	++	+++

CATH'LAB

REVUE DE CARDIOLOGIE INTERVENTIONNELLE

AVEC LA COLLABORATION DE CARDIOLOGIE PRATIQUE ET DU GACI

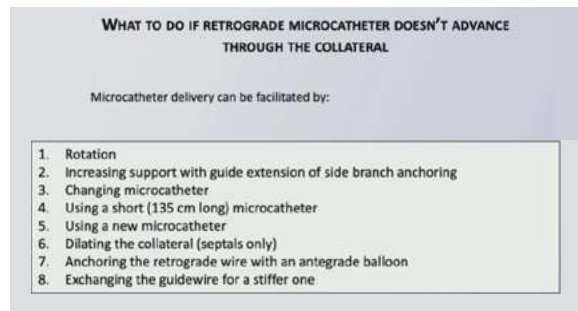
RENSEIGNEMENTS ET ABONNEMENT:

QR code



Day 2

The second day of the course was titled “I am confident in antegrade but I want to get better at retrograde and ADR” and began with Scott Harding presenting the importance of antegrade preparation even with the retrograde strategy. Gabriele Gasparini explained how to advance the microcatheter through the septals in some cases. He emphasised the importance of avoiding aggressive manoeuvres so as not to create perforations. He suggested using torqueable microcatheters so that they can be rotated, improving retrograde support with an anchored balloon, guidewire extension, or the help of a second operator, and changing the microcatheter for one that has a lower profile or is shorter. Another option for septal collaterals is dilating the septal with a small balloon, anchoring the retrograde wire with an antegrade balloon and finally exchanging the guidewire for a stiffer one. If none of these options work, Gabriele suggested crossing the CTO using the retrograde guidewire and finishing with the Tip-in technique, which involves using the retrograde guidewire as a marker to direct the antegrade guidewire and using another collateral.



Crossing difficult collaterals presented by Gabriele Gasparini

The star live case of the day was performed by Paul Kao and Bo-Chih Lin from the National Taiwan University Hospital in Taipei. This was a right coronary CTO in a previously bypassed patient with an occluded bypass. The operators initially attempted a retrograde strategy via the collaterals from the circumflex using a Sion Blue guidewire (Asahi) and a Caravel microcatheter (Asahi), then exchanged the guidewire for a Suoh 03 (Asahi) for a few minutes. Unfortunately this was complicated by a small perforation which caused them to change their strategy. Using a Sion Black (Asahi) and a Corsair Pro (Asahi) they entered the vein graft and switched out the guidewire for an UltimateBros 3 (Asahi) which advanced well and was exchanged for a Gladius (Asahi) forming a curve and crossing distally to the native artery. They then exchanged this for a Sion guidewire (Asahi) and exchanged the microcatheter for a Sasuke (Asahi) and then, using a Sion Black guide (Asahi) via the second lumen of the microcatheter, went up the native artery allowing the Sasuke to be switched out for a Caravel. Unfortunately, due to the kink formed, the guidewire could not advance any more, so

they exchanged it for a Gladius and then a Gaia Next (Asahi) which did not advance either. The operators started preparing the antegrade channel with a Gaia guidewire (Asahi) and a Corsair Pro microcatheter (Asahi), looped the Gladius EX guidewire (Asahi) using the retrograde technique and exchanged the Caravel for a Corsair Pro. They finished the case with a Reverse-CART guided by intracoronary IVUS imaging and externalising with an RG3 guide (Asahi). A very good result was obtained by adding two Orsio stents (Biotronik).



CTO-PCI of the right coronary artery in a bypassed patient whose graft was also occluded performed by Paul Kao and Bo-Chih Lin

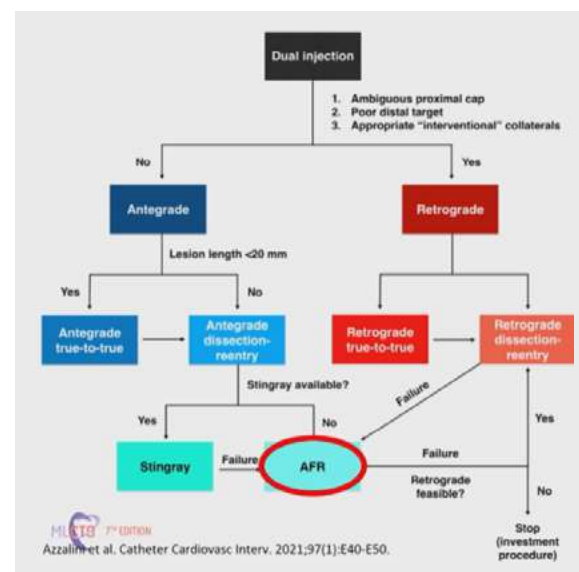
The second case of the day, a CTO of the LAD treated by ADR, was performed by Maksymilian Opolski with Stéphane Rinfret as proctor underlining the difficulties of proctoring.

In the second session, Khaldoon Alaswad presented his tips and tricks for successful antegrade dissection and re-entry. In order to access the sub-intimal space he suggested entering with a penetrating guide at the proximal cap and exchanging for a polymeric guidewire in order to form a loop or using the Carlino technique or the Power Carlino technique using a balloon parallel to the microcatheter in order to give it more support and trap it. To advance the knuckle, better support with anchoring is essential. By increasing the support of the guidewire catheter and dilating the track, the equipment can be delivered more easily. To visualise the distal lumen, the STRAW technique should be used by aspirating via the Stingray balloon. Finally if re-entering the lumen becomes difficult especially due to calcifications, an Astato 20 g or a Gaia Third are useful.

Benjamin Faurie presented the important factors to consider before crossing an epicardial connection. He began by highlighting the fact that epicardial collaterals that have high tortuosity and an angle <90° are a predictor of failure. He recommended a full analysis of the angiogram in order to select the best collateral in order to avoid spasm, friction or ischemia. Again stressing the need to know how to handle the guidewires and microcatheters in each situation, he recommended avoiding using a snare for externalisation.

Maximilian Opolski then presented the importance of cardiac CTs in CTOs. He underlined the fact that cardiac CT is better than angiography for the assessment of the proximal cap, the distal CTO segment, calcifications and tortuosity. He presented the CT-RECTOR score for predicting whether or not the guidewire will cross through the CTO quickly. He concluded by arguing that the best way to guide CTO PCIs is coronary CT co-registration in the cath lab.

Lorenzo Azzalini gave the potential options if the Stingray balloon fails. These included the LAST (Limited Antegrade Subintimal Tracking) technique or using a dual lumen catheter assisted wire re-entry, where the operator finds the resistance point and pushes towards the vessel lumen; using an inflated balloon, the Antegrade Fenestration Re-entry (AFR) technique; the STAR and Mini-STAR (Subintimal Tracking And Re-entry) techniques but this could be at the expense of branch loss; IVUS-guided re-entry; using the ReCross (IMDS) dual lumen microcatheter and finally the retrograde route. He also presented future technologies under development, such as a new balloon facilitating AFR and a Traverse allowing the aspiration of hematoma and re-entry.



Algorithm for alternative ADR re-entry options presented by Lorenzo Azzalini

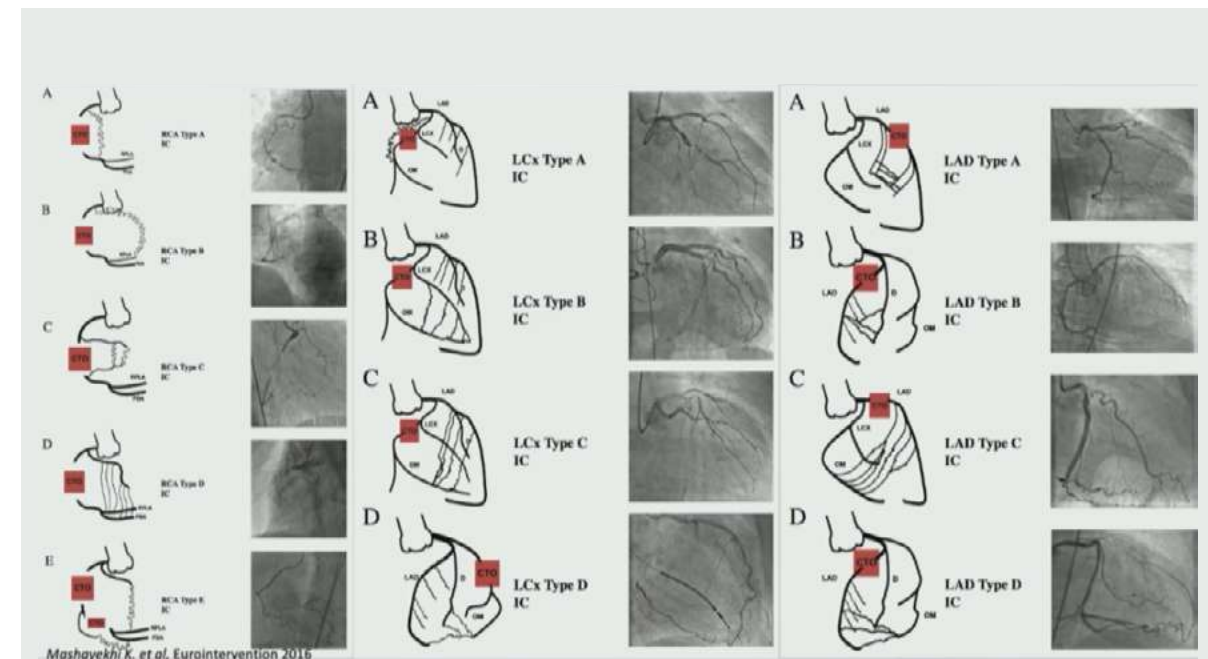


Day 3

As always, the third day featured the most complex cases. The title of the day, “I am an experienced operator but I'm pushed outside my comfort zone” sums up this last day. The two live cases presented by Chris Zambakides (Chris Hani Baragwanath Hospital - Johannesburg) and Masahisa Yamane (Polyclinique Saint Georges - Nice) ended with investment procedures after several long hours.

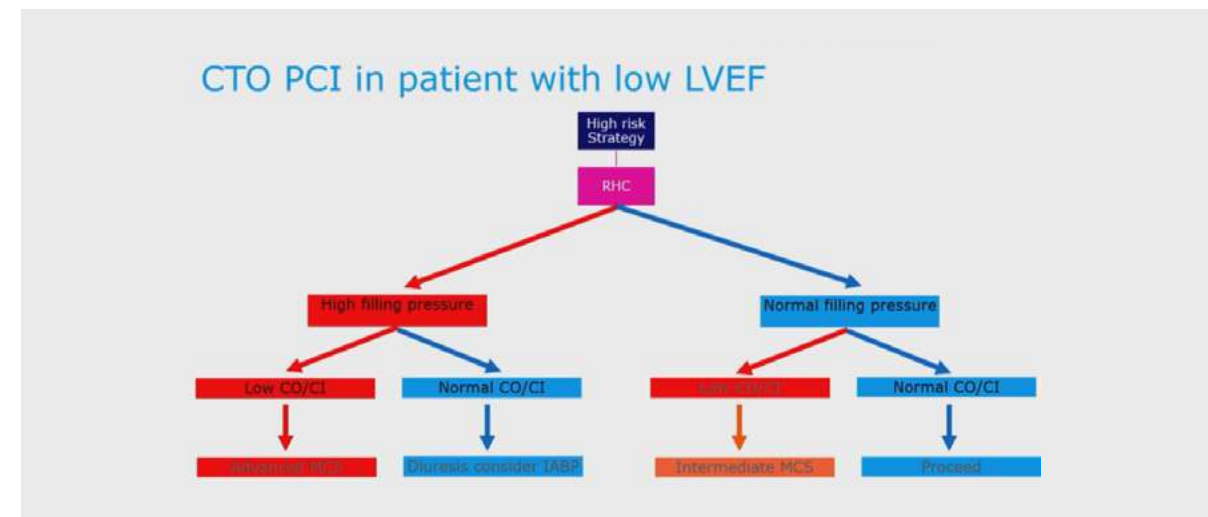
Kambis Mashayekhi presented the retrograde approach with ipsilateral connection. He reviewed the classification of these collaterals which are mostly epicardial and presented several case examples, highlighting the fact that there is a higher complication rate (tamponade) in PCIs. Kambis recommended the ping-pong technique using 8 Fr catheters to avoid wire or microcatheter entrapment.

Classification of ipsilateral collaterals presented by Kambis Mashayekhi



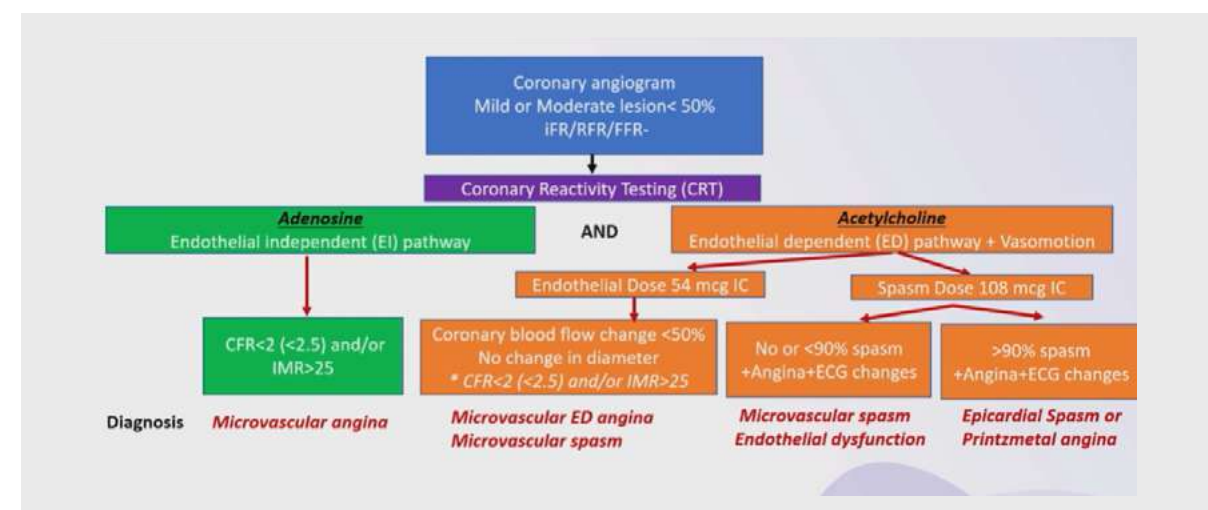
Khaldoon Alaswad talked about managing CTO in patients with low ejection fraction who have a higher risk of mortality. He reviewed the literature and showed the increased risk of cardiac events in patients with low ejection fraction who have unsuccessful CTO-PCIs as well as the net improvement in ejection fraction post-PCI. He suggested optimising their hemodynamic status, performing a right heart catheterisation (RHC), and reconsidering the strategy with Mechanical Circulatory Support (MCS).

Algorithm for CTO-PCI in patients with low ejection fraction presented by Khaldoon Alaswad



Olga Toleva presented the impact of CTO-PCI on ischemia and angina. In the literature, patients with residual post-PCI ischemia had a worse prognosis. She emphasised the usefulness of IVUS, protecting side branches, and continuing optimal post-PCI medical treatment. She also addressed outcome optimisation as well as microvascular dysfunction and coronary spasms. She underlined the usefulness of coronary flow reserve (CFR), index of microvascular resistance (IMR), and microvascular reserve resistance (MRR).

Microvascular dysfunction algorithm presented by Olga Toleva.



Conclusion

- Once again, the 2022 edition of MLCTO featured a relaxed scientific programme appreciated by CTO specialists from around the world.
- The cutting-edge presentations and live cases provided all the latest information on technology and techniques.
- The various discussions between experts and participants reflected the high educational quality of the course.
- The next edition is already shaping up to be an exciting event and in the meantime, the MLCTO Academy registers are always open for cases to be included!

1ST EDITION

MLCTO

MULTI-LEVEL CTO MIDDLE EAST

**THURSDAY 5TH & FRIDAY 6TH
OCTOBER 2023**

**INTERCONTINENTAL CITYSTARS
CAIRO, EGYPT**

LOCAL COURSE DIRECTORS

Ahmed ELGUINDY, MD
Tarek RASHID, MD
Yasser SADEK, MD
Khalid TAMMAM, MD

BOARD

Alexandre AVRAN, MD
Kambis MASHAYEKHI, MD
Stéphane RINFRET, MD

ORGANIZATION

Morgane Herrada
m.herrada@comnco.com
Tel. +33 (0)7 83 45 45 63

Valentine Dupondant
v.dupondant@comnco.com
Tel. +33 (0)6 29 80 82 46

ACADEMY.MLCTO.COM

9TH EDITION

MLCTO

SHARING KNOWLEDGE

SAVE THE DATE

JUNE 27TH – 29TH 2024
MULTI LEVEL CTO
ANNUAL COURSE

**PALAIS DE LA MÉDITERRANÉE
NICE, FRANCE**

CO-DIRECTORS

Alexandre AVRAN
Kambis MASHAYEKHI
Stéphane RINFRET



GE HealthCare

**A new era in stent
enhancement**

Powered by Allia™



Allia : Allia IGS5 : Utilisation prévue : Les systèmes angiographiques à rayons X sont indiqués pour les patients, du nouveau-né à la personne âgée, pour la production d'images fluoroscopiques et rotationnelles de l'anatomie humaine pour les procédures cardiovasculaires, vasculaires et non vasculaires, diagnostiques et interventionnelles. De plus, avec la table d'opération, les systèmes angiographiques à rayons X sont indiqués pour générer des images fluoroscopiques et rotationnelles de l'anatomie humaine pour des procédures chirurgicales guidées par image. La table d'opération est adaptée aux procédures interventionnelles et chirurgicales. Pour Allia IGS 5 : Classe : IIb, Fabricant : GE Medical Systems SCS 283 rue de la minière 78530 BUC - France | Organisme notifié : GMED, CE 0459. Toujours se référer au mode d'emploi avant utilisation et lire attentivement toutes les instructions pour assurer la bonne utilisation de votre dispositif médical. Dernière révision : 09-Avril-2021. Products mentioned in the material may be subject to government regulation and may not be available in all countries. Commercial availability of GE HealthCare medical systems is subject to meeting local requirements in a given country or region. Contact a GE HealthCare Representative for more information. Intended for healthcare professionals only. © 2023 GE HealthCare. Allia™ is a trademarks of GE HealthCare. GE is a trademark of General Electric Company used under trademark license. JB00126FB

EDUCATIONAL OPPORTUNITIES

ML CTO VIDEO LIBRARY

ACCESS TO THE ML CTO VIDEO LIBRARY FOR A WEALTH OF CTO PCI KNOWLEDGE & RETRIEVE VIDEOS FROM ALL EDITIONS ON ADR, ANTEGRADE, COMPLICATIONS, IMAGING, RETROGRADE, AND MUCH MORE.

+300 VIDEOS!
FREE ACCESS FOR
ML CTO MEMBERS



**The more you know,
the better the outcomes.**

Modern PCI

Join Boston Scientific at the 2023 Multi Level CTO Course at our booth and hands-on.

SCIENTIFIC SESSIONS

SESSION 4: SHOW ME MORE CASES!
Live Case #5
Thursday, June 29th
16:30 - 18:30

AT OUR BOOTH

Boston Scientific Modern PCI Booth
Exhibition hall - booth 19
Thursday, June 29th until Saturday, July 1st

All trademarks are property of their respective owner. ©2023 Boston Scientific Corporation or its affiliates. All rights reserved.

Longest Studied
Polymer-Free DES*

- ▶ All Comers
- ▶ Diabetic Subset
- ▶ ACS Subset

PROBUCOL
A safer solution replacing the need of polymers

MICROPOROUS SURFACE
(100% coverage)
for optimal drug release kinetics

ABLUMINAL COATING
Leading to faster endothelialization

ISAR TEST 5, JACC VOL. 76, NO. 3, 2020 Kufner et al.
JULY 14, 2020:146-58