EMJ EUROPEAN MEDICAL JOURNAL

INTERVENTIONAL CARDIOLOGY

ISSN 2053-423X — Vol 7.1 • July 2019 • europeanmedical-journal.com

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Aims and Scope

The European Medical Journal (EMJ) is an online only, peer-reviewed, open access general journal, targeted towards readers in the medical sciences. We aim to make all our articles accessible to readers from any medical discipline.

EMJ allows healthcare professionals to stay abreast of key advances and opinions across Europe.

EMJ aims to support healthcare professionals in continuously developing their knowledge, effectiveness, and productivity. The editorial policy is designed to encourage discussion among this peer group.

EMJ is published quarterly and comprises review articles, case reports, practice guides, theoretical discussions, and original research.

EMJ also publishes 16 therapeutic area journals, which provide concise coverage of salient developments at the leading European congresses. These are published annually, approximately 6 weeks after the relevant congress. Further details can be found on our website: www.europeanmedical-journal.com

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This Publication

European Medical Journal Interventional Cardiology is published once a year. For subscription details please visit: www.europeanmedical-journal.com

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EMJ Int Cardiol. 7.1

Welcome

It is with great pleasure that I welcome you to the 7th edition of *EMJ Interventional Cardiology*. Interventional cardiology continues to be a field brimming with ground-breaking innovation and enlightening research. The sharing of knowledge and best-practice is pivotal in a field with such high stakes, and EuroPCR plays a key role in the international collaboration within this discipline. This eJournal focusses on the key findings from the congress, with a range of reviews and highlights, as well as some special features that delve deeper into EuroPCR.

EuroPCR 2019 took place in Paris, France, at the Palais des Congrès, and the historical French capital did not disappoint as the host of this highly anticipated congress. This year, several topics came to light as focus points for the congress. Research was presented on intervention options for severe-symptomatic aortic stenosis, considering a preference between transcatheter aortic valve implantation and surgical aortic valve replacement. Another interesting presentation looked at percutaneous coronary intervention and the definition of patients who were at high risk of bleeding following this procedure. This session considered a consensus document that worked towards identifying these patients. The use of intracoronary imaging was also a hot topic, with a focus on guidance pertinent to this technique.

This year saw the 30th anniversary of EuroPCR and, to celebrate, we take a look back at the European Association of Percutaneous Cardiovascular Interventions history in this edition of the journal to gain insight into how this leading congress came about and better understand its mission. The congress has a rich history and a fascinating growth story, building from a meeting that hosted a few dozen people to a conference that saw >11,000 attendees this year. This article is not one to be missed!

Founding member of EuroPCR Prof Jean Marco received the Andreas Grüntzig Ethica award this year for his contribution to the advancement of interventional cardiology. Our article on his achievements and award ceremony celebrates his commitment to the field and the work that he has enabled. The legacy he has created for himself continues to inspire interventional cardiologists around the world, as was evident from the high level of respect demonstrated by many at EuroPCR.

Here at EMJ, we love providing you with the highlights from a leading congress in this ever-evolving field. As always, it would be great to hear from you regarding any of the articles or congress content presented and we are always on the look out for new people to collaborate with. Without further ado, enjoy *EMJ Interventional Cardiology 7.1!*

Kind regards,

Spencer Gore

Chief Executive Officer, European Medical Group

Foreword

Dear colleagues,

It is my pleasure to present to you this issue of *EMJ Interventional Cardiology,* featuring a thorough review of EuroPCR 2019, recently held in Paris, France, from May 21st–24th.

As always, EuroPCR provided an interesting space for fellows, clinicians, researchers, and industry, to share their knowledge and advances in the field of interventional cardiology. This year, some interesting topics were reviewed and updated during the event. In this issue, we have summarised a selection of presentations and hot topics for those who were not able to attend the congress, and even if you did have the chance to be in Paris you will find it a valid source of information to apply in your daily practice. This eJournal features press releases from the congress, abstract review summaries written by the presenters themselves, and some key takeaway messages written by congress attendees. Of special relevance is the feature update on guidelines for the treatment of high bleeding risk patients, a complex subset of patients that as interventionists we are dealing with more and more every day, and that present as a challenge when deciding on dual antiplatelet therapy duration. Structural interventions were also among the most important topics in this year's EuroPCR. I encourage you to read the feature on Mitraclip, a device that has certainly sparked much debate in the world of cardiology.

Interviews and insights from our colleagues have always been a key aspect to report in *EMJ Interventional Cardiology*. In this issue, you will get to know more from our Editorial Board members, this year featuring an Interview with Prof Eduard Margetic.

This year's EuroPCR reached an important landmark, celebrating the event's 30th anniversary. The winner of this year's Ethica Award was none other than Prof Jean Marco. Back in 1989, Prof Marco laid the foundations of what was to become EuroPCR. His unselfish approach to teaching and sharing the knowledge in the field has made the expansion of EuroPCR and its allied courses around the globe possible. Prof Marco has always encouraged continuous education and have devoted his life to "Excellence in Education at Work," being a source of inspiration for many who decided to embrace interventional cardiology, especially for those of us involved in training future generations. Prof Marco's legacy and example should be honoured and remembered. Our article on the Ethica Award Ceremony will help you to gain insight into Prof Marco's outstanding career and accomplishments.

I am sure you will find this issue of *EMJ Interventional Cardiology* an entertaining, useful, and worthwhile read, as well as a source of information to help you in your daily practice.

Kind regards,

Dr Pablo Sepulveda Varela

Endovascular Therapy Center, Catholic University of Chile, Santiago, Chile

Congress Review

Review of the EuroPCR Congress 2019

Location: Paris, France – Palais de Congrès

Date: 21st - 24th May 2019

Citation: EMJ Int Cardiol. 2019;7[1]:10-19. Congress Review.

Paris: The city of love, oozing with art and culture, is celebrated for its wine, cheese, wide boulevards, and idyllic strolls along the river Seine; how fitting that the city associated with amour should play host each year to hordes of interventional cardiologists with intrigue and passion for the human heart. The country too has a strong association with heart medicine; in 1844, French physiologist Claude Bernard coined the term 'cardiac catherisation': using catheters to measure intracardiac pressures in animals.[1] Not long after, French surgeon Alexis Carrel performed the first canine bypass surgery, and in 1912, was awarded the Nobel Prize in Physiology or Medicine for his pioneering work in vascular suturing techniques.[2,3]

On the beautiful spring morning of Tuesday 21st May, the Palais de Congrès opened its doors to >11,000 participants: interventional cardiologists, surgeons, imaging specialists, nurses, researchers, industry representatives, and other practitioners and innovators, from around the world, all excited to learn and be challenged over the next 4 days. It really was the place to be to learn about the hottest news in cardiovascular interventions and cutting-edge techniques, with topics including acute heart failure, bifurcation lesions, carotid stenting, mitral valve replacement and repair, ST-elevation myocardial infarction (STEMI), stents and scaffolds, and transcatheter aortic valve implantation (TAVI), to name a few.[4]

The congress kicked off with a live case demonstration from Clinique Pasteur, Toulouse, France. As the main arena began to fill, a buzz of excitement filled the air, along with a flurry of whispers on what was to come. Dr William Wijns, Chairman, PCR, and Farrel Hellig took to the stage to address the audience.[5] "Each course is different and this one is very special because we are celebrating the 30th anniversary of PCR," said Dr Wijns. A large projector took the audience live to Toulouse, where Dr Jean Fajadet and Dr Bruno Farah were performing percutaneous coronary

intervention (PCI) of distal left main (LM) and proximal dominant LCx lesions on an 86-year-old female. The audience watched in near silence for an hour and a half: the only sound was that of pens scratching frantically in fresh notepads.

After the live demonstration, an interview with both operators was streamed, with >250 questions having flooded in from audience members. Speaking to Dr Fajadet, Dr Wijns said: "It was 30 years ago today that this adventure started in France when Jean Fajadet and Jean Marco decided that they would create a new course in Toulouse." He asked Dr Fajadet "I'm sure you remember it as if it were yesterday?"[5]

Outside the operating room, still dressed in his scrubs, Dr Fajadet spoke into the microphone: "It's very emotional for me – 30 years is a long time and it's been a fantastic adventure. When the course began, we had only a simple device: the PTCA [percutaneous transluminal coronary angioplasty] balloon catheter. We wanted to extend the treatment of simple lesions to more complex lesions and so we designed a course where we could invite everyone and expand knowledge."[5]

Now, 30 years on, the founders have, without a doubt, created a meeting where individuals can come together to learn from one another, share, and become better healthcare professionals. In addition to the live session from Toulouse, the congress included many other live sessions from around the world including Spain, Italy, Germany, UK, Denmark, and Singapore.

Over the next 4 days, a cornucopia of session formats were offered to attendees in the extensive programme: abstract presentations; case discussions; late-breaking trials; imaging learning centres; symposiums; tutorials; and a session named 'an image is worth a 1,000 words', in which attendees were presented with rare, interesting, and puzzling images, and topics were discussed on what they saw, what diagnostic elements they recognised, and finally how they would go about treating such a case.

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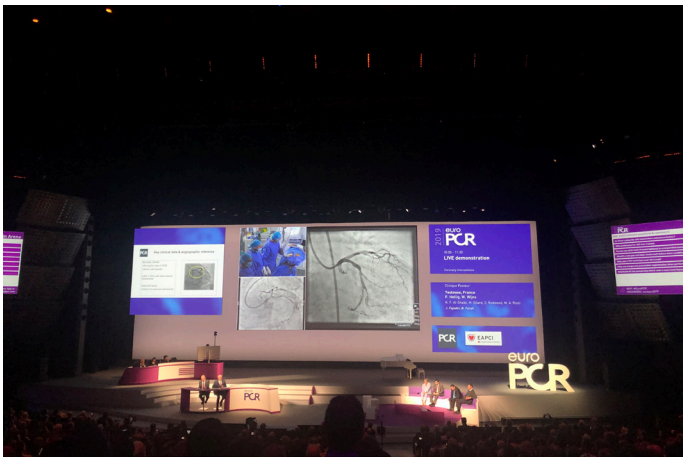

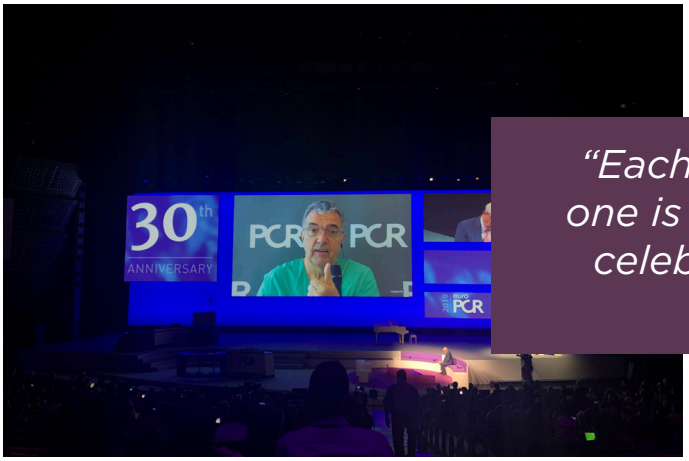

At the end of the congress, everyone left with much to discuss, having experienced presentations on the latest research and late-breaking trials. These included: clinical uses of intracoronary imagine; interventions and outcomes with paclitaxel drug coated balloons, evolving indications for TAVI patients with severe symptomatic aortic stenosis, defining high bleeding risk in patients undergoing PCI, and percutaneous edge-to-edge repair in patients with heart failure and secondary mitral regurgitation.[4]

As the 30th anniversary of EuroPCR drew to a close, Prof Jean Marco, co-founder of the congress, took the stage to give the audience some food for thought and to receive the EuroPCR 2019 Andreas Grüntzig Ethica Award, for his lifelong service to interventional cardiology and its community. *EMJ Interventional Cardiology 7.1* covers this content for you in the coming pages, so please sit back, relax, and read all the brilliance that EuroPCR 2019 had to offer. We are already looking forward to next year's annual meeting and hope to see you there in Paris.

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"Each course is different and this one is very special because we are celebrating the 30th anniversary of PCR..."

EUROPCR 2019 REVIEWED →

Severe Symptomatic Aortic Stenosis Intervention Options

INTERVENTION in Europe and the USA is most commonly necessitated by severe symptomatic aortic stenosis.

INTERVENTION in Europe and the USA is most commonly necessitated by severe symptomatic aortic stenosis. The degenerative disease and the interventions associated with it were discussed in a session at the EuroPCR congress, and reported in a EuroPCR press release dated 21st May 2019. The session reviewed several pieces of research into two interventions to identify a preference, as well as offering recommendations for the method of deciding which intervention is the most appropriate.

Heart failure and angina are among the symptoms of aortic stenosis, and the disease can lead to obstruction of the left ventricle outflow due to immobilisation and calcification of the aortic valve leaflets. For aortic stenosis, no medical treatment currently exists that is effective, so intervention is key to avoiding further problems; however, the diseased valve can only be repaired by replacement via transcatheter aortic valve implantation (TAVI) or by surgical aortic valve replacement (SAVR). TAVI is less invasive and a series of randomised controlled trials have been carried out; prior to the development of TAVI, the field was lacking in randomised evidence.

Guidelines surrounding severe aortic stenosis in patients who are extreme, high, or intermediate-surgical risk recommended TAVI for extreme-surgical risk patients as the therapy of choice. At increased surgical risk, TAVI was recommended as an alternative treatment to SAVR; the heart team made decisions on a case-by-case basis depending on the patient's characteristics. For example, TAVI was preferred in elderly patients. SAVR remains to be the standard intervention for low-risk patients.

After comparing several pieces of research, this session concluded that TAVI has a superiority over SAVR at 2-year follow-up regarding improvements in risk of stroke, death, and hospitalisation. Utilisation of healthcare resources was also associated with TAVI due to its shorter interventions, shorter hospital stays, decreased need for rehabilitation, and quicker recovery to everyday life. These preferential outcomes of TAVI were consistent across findings; there is a suggestion that basing decisions on surgical risk is no longer ideal. Heart teams should consider characteristics to identify the best intervention option. The session authors recognised the need for further research to address further uncertainties and enhance outcomes, such as TAVI in asymptomatic aortic stenosis patients.

The Best Innovations in Cardiovascular Medicine: A Discussion

Interventional cardiologists Ran Kornowski (Rabin Medical Centre, Petah Tikva, Israel) and Nicolo Piazza (McGill University Health Centre, Montreal, Canada) were on-hand at EuroPCR to engage in a spirited discussion on the most exciting developments presented as part of 'Innovators Day.' Innovators Day is a platform through which various experts across the cardiovascular landscape, including scientists, clinicians, and industry representatives, can discuss newly emerging incentives to help innovate the cardiovascular field.

Piazza highlighted how innovation can occur across many cardiovascular areas, for instance in coronary research, structural heart disease, cardiovascular neurology, and heart failure. When asked about the developments in coronary intervention, Kornowski proceeded to discuss how at this year's EuroPCR there was an increased focus on improving the efficacy of drug-eluting balloons and drug distribution, as well as for tackling the problem of microvascular dysfunction. He commented on how a new outlook has emerged in which both coronary and structural/intervention-based aspects must be considered simultaneously to provide optimal treatment for patients with cardiovascular disease. "There is a perception that the field of coronary intervention has plateaued, but I know there is still room for improvement."

Piazza next broached the topic of ancillary devices for structural heart disease. Kornowski mentioned several new and exciting ideas, including a new artificial tricuspid valve and new procedures for performing mitral regurgitation. These include the 'cerclage' technique, a very provocative concept that could serve as a platform for additional interventions. "A lot of attention is being given towards improving mitral care and tricuspid care. Hopefully in years to come we will see these developments become standard of care." Kornowski emphasised the importance of resilience and patience in bringing these original ideas to clinical fruition.

Piazza next turned the topic of conversation to cardiovascular neurology, particularly the potential for targeting stroke or the para/sympathetic nervous system to improve cardiovascular outcomes. Koronowski explained how he was fascinated by the idea of selective brain cooling as a means to treat stroke and expressed his wish for it to enter the next developmental stage in clinical trials. As a lot of stroke patients are not being treated with percutaneous devices or acute interventions, this merging of fields holds true therapeutic potential by increasing the number of ways in which we can tackle stroke.

Piazza concluded the interview by highlighting the fact that Innovators Day is clearly a very healthy addition to EuroPCR, with a number of devices being developed across the aforementioned cardiovascular areas. He agreed with Kornowski on the importance of resilience to see these developments through to clinical utility and patient benefits. Koronowski added that an acceptance and meeting of hurdles and the potential for failure is a hallmark of being an innovator, truly a key message to take home from the congress.

Industry-Wide Pooled Analysis Planned to Determine the True Long-Term Safety of Paclitaxel-Based Interventions

Following the publication of a meta-analysis by Dr Katsanos, Patras University Hospital, Rion, Greece, in 2018, there was widespread concern for the safety of paclitaxel-eluting stents and paclitaxel drug-coated balloons (DCB). However, many in the interventional community think that there are serious limitations to the study, and that the results may not be as conclusive as first conceived. Alexandra Lansky presented a discussion of this in a statement on 21st May 2019 at EuroPCR, Paris, France.

This controversial study claimed that use of these paclitaxel interventions in femoropopliteal disease was associated with increased death between 1 and 5 years post treatment compared with uncoated versions. These conclusions lead to an industry-wide discussion into the safety of these interventions, and even resulted in the suspension of two large, prospective, randomised trials (BASIL 3 and SWEDPAD).

The methods of the study have particularly been criticised. In addition to limited long-term data and a high drop-out rate (resulting in >80% loss of patient data at 4–5 years), the meta-analysis used study-level (rather than patient-level) data, did not know the occurrence of repeated exposure to paclitaxel during re-interventions, had a lack of judgement on the causes of death, and had corrections to primary source data.

Subsequent sponsor-driven analyses have been performed using patient-level data from clinical trials and have not been able to replicate the claims from the Katsanos study. However, the interventional community is planning an industry-wide pooled analysis to compare long-term safety outcomes, and this will be presented to the US Food and Drug Administration (FDA) in mid-June. EuroPCR acknowledged the vital need for further studies and strongly supports resuming the BASIL 3 and SWEDPAD trials.

Because of the lack of strong evidence and the awaited outcomes from the large pooled analysis, there is currently little justification to change clinical practice and day-to-day use of paclitaxel-based DCB.

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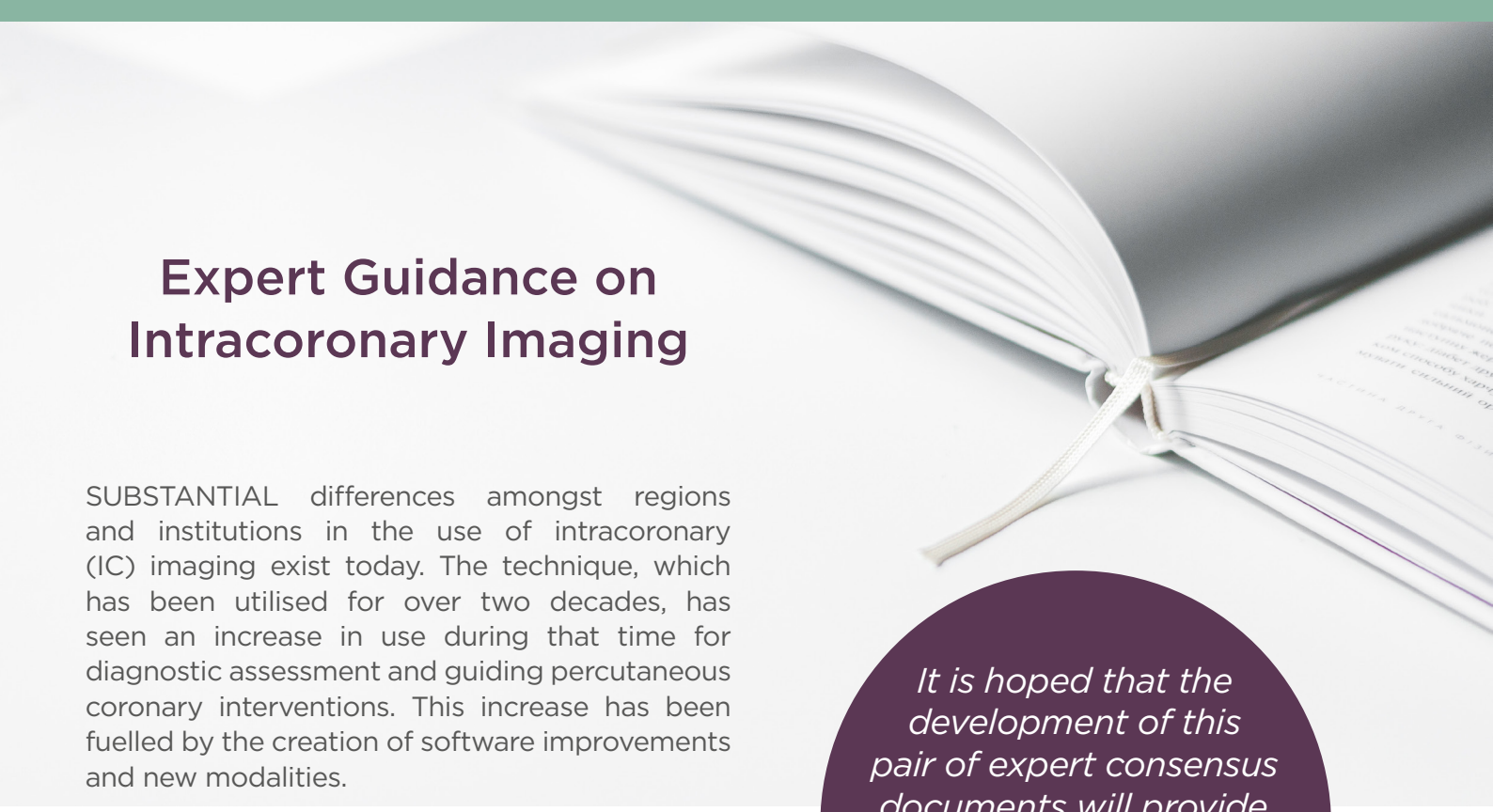
Expert Guidance on Intracoronary Imaging



SUBSTANTIAL differences amongst regions and institutions in the use of intracoronary (IC) imaging exist today. The technique, which has been utilised for over two decades, has seen an increase in use during that time for diagnostic assessment and guiding percutaneous coronary interventions. This increase has been fuelled by the creation of software improvements and new modalities.

In the context of this usage variability, the European Association of Percutaneous Cardiovascular Interventions (EAPCI) has produced two expert consensus documents to guide clinicians worldwide. The first expert consensus document was published in 2018, and it focussed on the impact of intracoronary imaging guidance on cardiovascular outcomes. The document highlighted the patients who were deemed the most likely to clinically benefit from an intervention guided by imaging and examined the strengths and limitations of using intravascular ultrasound and optical coherence tomography to guide percutaneous coronary interventions, among other topics.

The second expert consensus document detailed the use of IC imaging for three areas:

1. To clarify angiographic ambiguity.
2. To guide decision-making about the severity of a lesion.
3. To delineate the extent of coronary artery disease.

This document was presented at the EuroPCR congress and its key points were disseminated in a EuroPCR press release dated 21st May. There were a number of takeaway messages:

- The OPINION and ILUMIEN III randomised controlled trials have confirmed the equivalence of intravascular ultrasound and optical coherence tomography.
- IC imaging is of great assistance to the clinician when preparing for a left main stem intervention. Its use facilitates understanding of the anatomical complexity, enabling an optimal plan to be put in place for the percutaneous coronary intervention.
- Intravascular ultrasound can be used in the assessment of the functional significance of left main stem disease. A minimal lumen area of <4.5 mm^2 suggested that revascularisation should be considered. A minimal lumen area of >6 mm^2 suggested optimal medical therapy should be used for a conservative treatment approach.
- Prior to undertaking percutaneous coronary intervention, IC imaging is a crucial step. This is because it enables the clinician to better understand the underlying lesion substrate.

It is hoped that the development of this pair of expert consensus documents will provide pertinent guidance for the international cardiology community...

It is hoped that the development of this pair of expert consensus documents will provide pertinent guidance for the international cardiology community and help to ensure optimal patient care.

New Definition of Patients at High Bleeding Risk After Percutaneous Coronary Intervention

BLEEDING during percutaneous coronary intervention (PCI) is a major risk to patients, but, until now, a standardised definition for high bleeding risk (HBR) patients has not existed. Now, the Academic Research Consortium for High Bleeding Risk (ARC-HBR) has stepped up to the challenge, creating a consensus document to better stratify HBR patients after PCI. In a dedicated session on 22nd May, reported in a EuroPCR press release, panellists presented information on the background of these risks, the importance of understanding how these risks affect certain patient populations, and how the updates to the guidelines can be adopted into clinical practice.

Prof Roxana Mehran, Mount Sinai Hospital, New York City, New York, USA, began her presentation discussing bleeding as a predictor of mortality. She summarised the findings of the ACUITY and ADEPT-DES trials, highlighting the findings that within 1 year, more patients died of major bleeding than of myocardial infarction, and within 2 years, post-discharge bleeding was a major predictor of mortality. Comorbidities, bleeding history, age, and haematological factors are just some of the indications of HBR, which can be predictable or unpredictable. Historically, the patients with these indications have been excluded from clinical trials, meaning that a better understanding of these populations is vital to improving patient outcomes.

Prof Mehran continued to compare the inclusion criteria, endpoints, and findings of a number of shorter dual antiplatelet therapy (DAPT) trials that included HBR patients, such as ZEUS, LEADERS FREE, and SENIOR. The findings from these studies suggest that bare-metal stents were not suitable for these patients, in particular elderly patients >80 years of age. Prof Mehran concluded that there was an unmet need for standardised definitions of HBR and related risk scores. Without these, Prof Mehran suggested that treatment decisions are left much more to chance, putting patients at risk. When asked, the audience estimated ~40% of patients in their hospitals to be at HBR, suggesting that current guidelines apply to only ~50% of patients seen daily.

Prof Davide Capodanno, University of Catania, Catania, Italy, followed this presentation by discussing current guidelines for DAPT in HBR and non-HBR patients in more depth. He noted that there were differences between the definitions of the American College of Cardiology (ACC)/American Heart Association (AHA) and the European Society of Cardiology (ESC). While the former defines HBR as a history of prior bleeding, oral anticoagulant therapy, female sex, advanced age, low body weight, chronic kidney disease, diabetes, anaemia, and/or chronic steroid or NSAID therapy,[1] the ESC defines this as 'an increased risk of spontaneous bleeding

during DAPT (e.g., PRECISE-DAPT score ≥25)' and assigns scores to the differing risk factors, such as age ≥75 years (0–19 points), renal disease (0–25 points), anaemia or transfusion (0–15 points), actionable bleeding (0–26 points), and high white blood cell count (0–15 points).[2] Thus, predicting bleeding remains a challenge for clinicians.

Prof Capodanno alluded to Prof Mehran's presentation as he moved on to discuss the inclusion criteria for clinical trials of HBR patients. He noted that these criteria were mixed between trials, so, as well as standardised definitions and risk scores being necessary, more consistent inclusion criteria for clinical trials are also necessary to ensure the most useful results. He then continued to discuss the work of the ARC-HBR and their new definitions of HBR.

The ARC-HBR comprises expertise from many related fields, including physician–scientists, regulatory authorities, and leading research organisations. This group examined available evidence, developing a consensus-based definition of HBR, elucidating 14 major criteria and 6 minor criteria. This was done by first reviewing bleeding rates in published DAPT trials and the HBR criteria in completed and ongoing clinical trials. Following this, the committee analysed the bleeding risk scores and assessed the impact of baseline variables. These criteria were announced in a EuroPCR press release following the session.

The major criteria were defined as:

- The use of oral anticoagulation.
- Severe or end-stage chronic kidney disease (estimated glomerular filtration rate <30 mL/min).
- Moderate or severe anaemia (haemoglobin <110 g/L).
- Spontaneous bleeding requiring hospitalisation or transfusion in the past 6 months, or recurrent bleeding.
- Moderate or severe thrombocytopenia (<100x10^9/L).
- Chronic bleeding diathesis.
- Liver cirrhosis with portal hypertension.
- Active malignancy in the last year.
- Previous spontaneous intracranial bleeding.
- Traumatic intracranial bleeding in the past 6 months.
- Recent major surgery or trauma in the past 30 days.
- Planned surgery on dual antiplatelet therapy.
- Known brain arteriovenous malformation.
- Moderate or severe stroke in the last 6 months.

The minor criteria were defined as:

- Patient aged ≥75 years.
- Moderate chronic kidney disease (estimated glomerular filtration rate 30–59 mL/min).
- Mild anaemia (haemoglobin 110–129 g/L in males, 110–119 g/L in females).
- Spontaneous bleeding requiring hospitalisation or transfusion 6–12 months before PCI.
- Chronic NSAID or steroid use.
- Ischaemic stroke >6 months before PCI.

If at least one major criterion or two minor criteria are met, the patient is at HBR.

This consensus document represents the first step in providing guidance for both clinical trial recruitment and clinical decision making in patients who may undergo PCI. The work of the ARC–HBR is ongoing and will next consider design principles for clinical trials of devices or drugs for HBR patients.

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This consensus document represents the first attempt to provide guidance for both clinical trial recruitment and clinical decision making in patients who may undergo PCI.

Congress Feature

To Clip or Not to Clip

Layla Southcombe
Editorial Administrator

Despite advances, open-heart surgery remains a risky procedure, and its risk–benefit profile means that it is not an option for all patients with severe secondary mitral valve regurgitation (MR). Complications can arise as a result of such a procedure, including blood clots, wound infection, and pneumonia, as well as many other potentially lethal adverse events. Thus, a minimally invasive treatment option for those unable to undergo normal surgery was in dire need at the turn of the millennium. Prof Ottavio Alfieri and Dr Mehmet Oz developed a solution, using a catheter to put just a single clip into the mitral valve to close the leak. This was the birth of MitraClip.

In 2003, just 6 years after filing the patent, MitraClip was inserted into a patient for the first time and has since been implanted in >30,000 patients.[1] In addition to reducing mean length of hospital stay to only 2.4 days, this procedure was $2,200 cheaper per patient. All data seemed to conclude that this 'simple' clip had revolutionised the treatment for MR, until the results from two post-marketing trials, presented at EuroPCR this year, showed conflicting conclusions.

Results from the COAPT[2] (Cardiovascular Outcomes Assessment of the MitraClip Percutaneous Therapy for Heart Failure Patients with Functional Mitral Regurgitation) trial suggested that the use of MitraClip for MR was highly beneficial for MR patients. In contrast, MITRA-FR[3] (Percutaneous Repair with the MitraClip Device for Severe Functional/Secondary Mitral Regurgitation) results did not show any significant difference in unplanned hospitalisations or mortality between those who received the MitraClip versus those given standard medical therapy. The cardiology community was urged to rethink the use of MitraClip in their day-to-day practice, and to become increasingly selective as to whom, if anyone, should receive this treatment.

Even though both studies set out to analyse the safety and efficacy of the treatment, their methods differed. All the patients involved in both trials had symptomatic heart failure and secondary MR; however, the criteria for inclusion in the MITRA-FR trial was severe MR, compared to moderate–severe MR in the COAPT trial. In the MITRA-FR trial, severe MR was defined as effective regurgitant orifice area (EROA) >20 mm^2 and/or a regurgitant volume >30 mL, and left ventricular ejection faction (LVEF) between 15% and 40%; in the COAPT trial, moderate–severe MR was defined as EROA >30 mm^2 and/or regurgitant volume >45 mL, and LVEF ≥20%.[4] Patients in the MITRA-FR trial had worse LV disease but less severe MR. This difference in inclusion criteria is thought to be the reason for the stark contrast in the trial results, with some cardiologists suggesting that the patients in the MITRA-FR trial received the MitraClip intervention 'too late' into their LV disease for it to have a positive effect on patient prognosis.

As per current guideline recommendations, once diagnosed with MR, medical therapy is initiated, and if the patient does not reach a condition of relieved symptoms or is stably bad for a period of 2 months, then further treatment options will be considered. Among these is the possibility of the insertion of a MitraClip. Normal contraindications to the success of MitraClip include patients who cannot tolerate procedural anticoagulation or a post-procedural antiplatelet regimen; those who have active endocarditis of the mitral valve; have rheumatic mitral valve disease; or have evidence of intracardiac, inferior vena cava, or femoral venous thrombus.[5]

"...the Mitra-FR trial should not change day-to-day practice: it was only one trial and long-term follow-up studies need to be completed to provide conclusive results..."

During the 'To Clip or Not to Clip' session at EuroPCR 2019 congress, two case reports of patients who received a MitraClip were discussed. The first was a 74-year-old man who had anterior ST elevation myocardial infarction and was denied cardiac resynchronisation therapy because of a right branch bundle block. With an elevated B-type natriuretic peptide (BNP) of 636 ng/L, EROA of 0.4 cm^2, left ventricular end-systolic dimensions (LVIDs) of 5.6 cm, left ventricular end-diastolic dimension (LVIDd) of 6.8 cm, and LVEF of 30%, this patient met the COAPT criteria. Upon initial view of the jet from the MR, the cardiologists were concerned that it seemed to be along the whole coaptation line, which would be a reason not to choose MitraClip; however, upon further inspection, two predominant jets were identified, making the patient eligible for the therapy. They decided to place two Xtr-MitraClips on the valve: one in the centre and one to the medial side of the centre. Six months post-surgery, the patient was asymptomatic, no reported breathlessness, and BNP reduced to 335 ng/L. Post Mitra-FR and COAPT trials, the cardiologists all agreed that clipping was the correct choice for this patient.

The second patient received MitraClip prior to the Mitra-FR trial. He was a 56-year-old man with longstanding dilated cardiomyopathy and a 15-year history of heart failure. In the lead up to the patient's referral, he had two prolonged admissions to hospital, his baseline BNP was elevated to 1,000 ng/L, and he was symptomatic. The patient presented with severely impaired LV function and discoordinate contraction, but the right side of his heart was normal, with only mildly elevated pulmonary pressure. With LVIDs and LVIDd being 6.2 and 7.2 cm, respectively, EROA of 23 mm^2, index and diastolic volume of 127 mL, and regurgitant volume of 38 mL, this patient would be at the lower end of the Mitra-FR inclusion criteria. Although it would not change the outcome of the health of the left ventricle, the cardiologists thought it would be beneficial to preserve the function of the right mitral valve, so decided to clip the patient. Despite a deterioration in LVEF to 20%, which is to be expected of a prolonged heart disease, the patient had reduced symptoms. Despite these improvements in symptoms, Dr Jonathon Byrne, the cardiologist of the patient, commented that in the future he would adopt strict adherence to the guidelines and only treat those who fit the COAPT criteria. Even though the second patient, according to the Mitra-Fr trial, would not have a better prognosis after receiving the MitraClip, one of the expert cardiologists on the panel stated that he would still clip the patient if he was referred today. He also commented that the Mitra-FR trial should not change day-to-day practice: it was only one trial and long-term follow-up studies need to be completed to provide conclusive results, not just on the prognosis, but the resolution of symptoms in secondary MR patients. Furthermore, the cardiologist stated that if he can improve the patient's symptoms, even if prognosis is not altered, then he would still choose to clip.

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The EuroPCR 2019 Andreas Grüntzig Ethica Award

Louise Rogers
Editorial Assistant

On Thursday 23rd May, the final day of EuroPCR, the European community of interventional cardiology celebrated and paid respect to Prof Jean Marco as he received the Andreas Grüntzig Ethica award: an honour given to those who have made a considerable contribution to the needs of patients through sharing of their wisdom, skills, and practice to fellow members of the community. Prof Marco represents a professional of the highest calibre in this respect: as well as being a founding member of EuroPCR, he has demonstrated a lifelong commitment to the education of cardiovascular healthcare professionals and a persistent determination to improve the lives of patients.[1]

At the beginning of the award ceremony, Dr Jean Fajadet, Vice Chairman of EuroPCR, addressed the audience. "This really is one of the most beautiful, emotional moments of the 30 year anniversary," Fajadet proclaimed as he invited Dr William Wijns, Chairman of EuroPCR, onto the stage to present the award alongside himself. Dr Wijns began to tell Prof Marco's story: how his commitment to excellence in education began at a young age and came from his ability to critically think and self-evaluate, and was always routed in respectful peer-to-peer interactions and non-judgemental sharing of experience. "Prof Marco's legacy is well alive and will continue to inspire generations of colleagues worldwide who have inherited his fundamental principles of sharing impactful, relevant, life-long, and self-directed learning. His 360-degree vision demands constant curiosity, out-of-the-box thinking, and open-minded adaptation to local needs and culture, enabling a caring impact on the life of each and every individual patient and her or his family," announced Dr Wijns as he invited Prof Marco onto the stage to accept the award. Dr Wijns congratulated Prof Marco on behalf of himself and the thousands of colleagues who were "thankful to you for enticing each and every one of us to become a better doctor and a better person."

"Prof Marco's legacy is well alive and will continue to inspire generations of colleagues worldwide who have inherited his fundamental principles of sharing impactful, relevant, life-long, and self-directed learning."

A standing ovation spread throughout the main arena as Prof Marco walked on stage to receive his award. As he walked, Dr Fajadet, himself a colleague and life-long friend, delivered words that he declared were emotionally difficult for

him to share with everyone watching: "All of those, like me, who have had the privilege of working with you, were fascinated by several things. The first is your extraordinary capacity of working: you could not even imagine. Every morning at 7am in the catheterisation lab, and leaving at 8–9pm… and this for 30 years!" Dr Fajadet proceeded to highlight Prof Marco's professionalism in the workplace: his discipline, rigour, and precision; before also speaking of the award winner's high level of independence, honesty, and ethics.

Dr Fajadet proceeded to highlight Prof Marco's professionalism in the workplace: his discipline, rigour, and precision; before also speaking of the award winner's high level of independence, honesty, and ethics.

Dr Fajadet reflected: "And a personal note, which is very deep in my heart: please accept my immense respect and gratitude for what you did for me. It has been a privilege to work with you for 37 years and I will continue to see you as my master, my reference, and my guide to lead the way. Be sure of my deep and unfailing friendship and my immense respect." The pair hugged, and it was evident to the room that their connection and friendship existed through not only work, but also a deep, personal bond.

"My story starts in 1986, with Fajadet," began Prof Marco. "We decided to build an ambitious project. Our first important principle was that we were capable of building the best. Each of you is capable of building the best." He said, addressing the audience.

He listed three points to building a long-term vision, the first being that you need to know where you are going. "[Fajadet and myself] agreed we were going to build the best unit for interventional cardiology in France and the best annual European course in the field of interventional cardiology."

His second point was needing to know what you should be doing. "For our European course, we knew we needed to create a course, in a large forum, to allow participants to critically reflect on their knowledge. You always have to start with the end in mind."

And finally, his concluding point for building a long-term vision was that you need to know how you are going to do it: "Each of you should be able to apply what is possible, as soon as possible, in your institutions."

Prof Marco ended his speech with a string of words: "Commitment, determination, dream, energy, stamina, inspire, drive, learn, and share. Use a teamwork approach and have strong work ethics that include honestly and integrity." His final words resonated around the arena: "The most important thing that I have learned during this journey though, is what I have learned from each of you, from all of you. You all have my sincerest thanks. Thank you!"[2]

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Five Key Messages From EuroPCR 2019

Dr Panagiotis Xaplanteris
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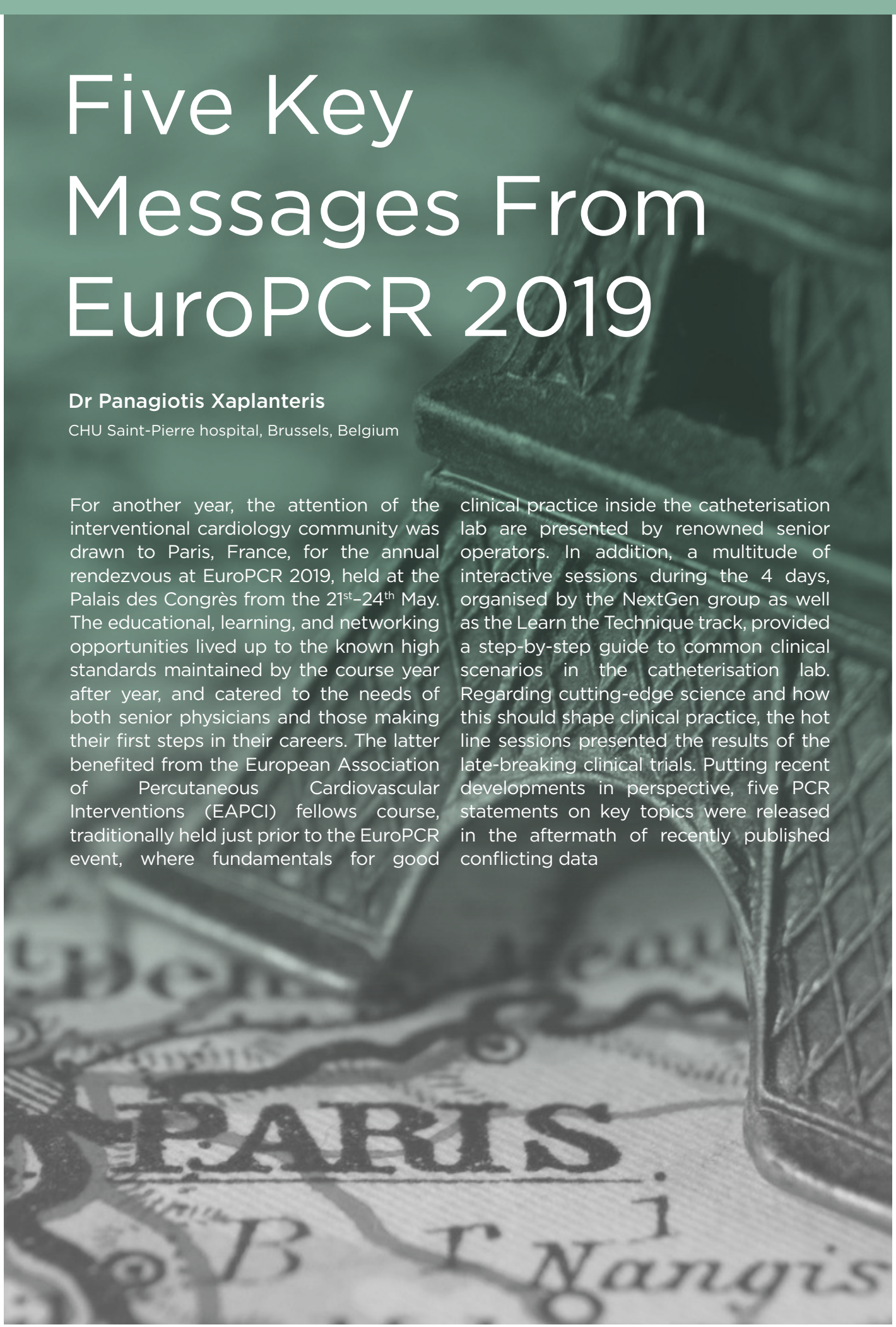
For another year, the attention of the interventional cardiology community was drawn to Paris, France, for the annual rendezvous at EuroPCR 2019, held at the Palais des Congrès from the 21st–24th May. The educational, learning, and networking opportunities lived up to the known high standards maintained by the course year after year, and catered to the needs of both senior physicians and those making their first steps in their careers. The latter benefited from the European Association of Percutaneous Cardiovascular Interventions (EAPCI) fellows course, traditionally held just prior to the EuroPCR event, where fundamentals for good clinical practice inside the catheterisation lab are presented by renowned senior operators. In addition, a multitude of interactive sessions during the 4 days, organised by the NextGen group as well as the Learn the Technique track, provided a step-by-step guide to common clinical scenarios in the catheterisation lab. Regarding cutting-edge science and how this should shape clinical practice, the hot line sessions presented the results of the late-breaking clinical trials. Putting recent developments in perspective, five PCR statements on key topics were released in the aftermath of recently published conflicting data



1

A percutaneous edge-to-edge repair (using the MitraClip device) in patients with heart failure and secondary mitral regurgitation (MR), who remain symptomatic despite optimal medical therapy (OMT) and cardiac resynchronisation therapy, should be sought.

In the aftermath of the COAPT trial that demonstrated a lower rate of heart failure hospitalisations and all-cause mortality at 24 months with the use of the technique, the role of percutaneous edge-to-edge repair is now solidified for symptomatic heart failure patients with at least moderate-to-severe MR. Dr Kar, from the Centre for Advanced Cardiac and Vascular Interventions, Los Angeles, California, USA, presented data from the trial exploring the mechanistic relation between MR reduction and the observed outcomes. Lower residual MR at 30 days was strongly associated with reduced hospitalisations, all-cause mortality, and improved quality of life compared with residual MR of 3+/4+. The improvement in MR was significantly more durable over time compared to OMT alone.

A PCR statement presented by Prof Prendergast from St Thomas' Hospital, London, UK, highlighted the role of the Heart Team for the assessment of patients, optimisation of therapy, consideration of device therapy, transcatheter mitral intervention, and surgery.

The transcatheter edge-to-edge repair is appropriate in carefully selected patients who remain symptomatic despite OMT (including cardiac resynchronisation therapy) and have:

- Severe MR (effective regurgitant orifice area [EROA] ≥30 mm^2, regurgitant volume ≥45 mL, or regurgitant fraction ≥50%).
- Suitable valve morphology (assessed by comprehensive echocardiography).
- Left ventricular systolic dimension <70 mm.
- Absence of significant right ventricular dysfunction, tricuspid regurgitation, and pulmonary hypertension.

The role of other transcatheter interventions remains under investigation, while surgical treatment may be considered as an add-on to surgical revascularisation. Circulatory support devices or transplant should be considered for cases with extreme left or right ventricle failure.

2

...these reports point to a favourable outcome regarding repeat revascularisations with ultrathin strut stents...

The use of stents with thinner struts results in fewer repeat revascularisations but does not further reduce hard endpoints.

According to the thin strut hypothesis, stents with thinner struts result in less vessel injury, inflammation, and thrombus formation compared to thicker struts. In the mid-term, this leads to faster endothelialisation and early vascular healing, and possibly lowers the risk of uncovered or malapposed struts in the long term.

Dr von Birgelen from the Thorax Centrum Twente and University of Twente, Enschede, Netherlands, presented an analysis of the BIORESORT trial with the 3-year results of treatment of small coronary target lesions (diameter <2.5 mm). A stent with ultrathin struts (Orsiro, strut thickness of 60 µm, sirolimus-eluting) was compared to a very thin strut stent (Synergy, everolimus-eluting) and a thin strut stent (Resolute Integrity, zotarolimus-eluting). No statistical significance in target lesion failure, cardiac death, and target vessel myocardial infarction was evident. However, all-comer patients with small lesions treated with the ultrathin strut stent experienced fewer repeat target lesion revascularisations than patients treated with the thin strut stent (2.1% versus 5.3%).

Retrospective, real world data from the Swedish Coronary Angiography and Angioplasty Registry (SCAAR) comparing the Orsiro ultrathin strut stent to several other newer generation drug-eluting stents were presented by Dr Buccheri from Uppsala University, Uppsala, Sweden. Low rates of definite stent thrombosis coupled with significantly lower rates of target lesion revascularisation (1.6% versus 2.3%) and a trend for lower in-stent restenosis with the Orsiro stent (4,561 patients) were reported, as compared to the newer generation stents (69,570 patients).

Dr Hudec from Suscch, Banksa Bystrica, Slovakia, presented similarly favourable outcomes with the use of the BioMime stent (strut thickness of 65 µm, sirolimus-eluting) in 520 patients. At 9 months, the rates of all-cause mortality, myocardial infarction, and target lesion revascularisation were 0.39%, 0.58%, and 0.97%, respectively; no cases of stent thrombosis were observed. The same stent platform was studied in the MILES-UK registry; data presented by Dr Menown from the Craigavon Cardiac Centre, Craigavon, UK, pointed to a cumulative rate of 2.08% for target vessel failure at 9 months.

Taken together, these reports point to a favourable outcome regarding repeat revascularisations with ultrathin strut stents, both in the setting of a clinical trial and in the real world.

3

The long-term clinical outcomes after transcatheter aortic valve implantation (TAVI) are promising.

The recent publication of two trials regarding the use of TAVI in patients at low surgical risk was followed by an updated meta-analysis comparing TAVI and surgical aortic valve replacement (SAVR); throughout 2 years of follow-up, a 12% and 19% relative risk reduction for all-cause mortality and stroke were noted.[1] Accordingly, the PCR statement on the evolving indications for TAVI highlights the superiority of TAVI to SAVR with respect to death, stroke, and rehospitalisation, as well as the improved healthcare resource utilisation. Surgical risk estimation is no longer the basis to guide the choice between TAVI and SAVR, and prosthesis selection should be determined by life expectancy and durability (mechanical valves in younger patients and bioprostheses in older [>65 years of age] patients).

As a consequence of the expanded indications for TAVI, the question of long-term performance arises. Of note, currently the durability of the valves has been established for up to 5 years in clinical trials; data from registries can give us indications of the performance of TAVI beyond that.

In a hot line late-breaking trial session, Dr Testa from IRCCS Policlinico San Donato, Milan, Italy, presented data from the Italian registry regarding the long-term performance of the self-expanding aortic valve implant. At 8 years, mortality occurred in 80% of the 990 patients that were included in the registry. For those that survived, the mean transvalvular gradient remained stable over time, comparable to the gradient immediately post-implantation. In addition, the rates of paravalvular leakage and structural valve deterioration were consistently low. Similar findings were reported by Dr Sathananthan from St Paul's Hospital, Vancouver, Canada, regarding the 10-year follow-up of TAVI patients. Of the original cohort of high-risk patients, 6.6% survived up to 10 years. Of these patients, 76.5% did not have any moderate-to-severe structural valve deterioration, and 89.5% had freedom from reintervention. The mean gradient remained stable at 10 years. Data on prosthetic valve endocarditis from the Finnish registry (FinnValve registry) were presented by Dr Moriyama from the Heart and Lung Centre, Helsinki University, Helsinki, Finland. At 8 years, the rates of endocarditis were comparable between transcatheter (1.28%) and surgically implanted (1.39%) valves. Mortality rates following prosthetic valve endocarditis, however, remain high (52.5% at 1 year). Dr Bjursten from Skåne University Hospital, Scania, Sweden, corroborated these results by presenting respective data from Sweden for a follow-up of up to 10 years; 6-month survival was 58.0% and independent risk factors for the development of endocarditis were obesity, poor renal function, a transapical access, and a high preoperative aortic gradient.

The long-term clinical outcomes after transcatheter aortic valve implantation (TAVI) are promising.

4

The definition of high bleeding risk in patients undergoing a percutaneous coronary intervention (PCI) is now standardised...

The definition of high bleeding risk in patients undergoing a percutaneous coronary intervention (PCI) is now standardised, facilitating the identification of this vulnerable patient group in clinical practice, homogenising trial design, and reporting of results.

A PCR statement was issued on the matter, accompanying a consensus document from the Academic Research Consortium for High Bleeding Risk (ARC-HBR) that was recently published in the European Heart Journal.[2]

Major criteria include the use of oral anticoagulation, severe or end-stage chronic kidney disease (estimated glomerular filtration rate <30 mL/min), moderate or severe anaemia (haemoglobin <110 g/L), prior spontaneous bleeding requiring hospitalisation or transfusion during the prior 6 months (or at any time if recurrent), moderate or severe thrombocytopaenia (<100x10^9/L), chronic bleeding diathesis, liver cirrhosis with portal hypertension, active malignancy during the prior 12 months, prior spontaneous intracranial bleeding at any time, previous traumatic intracranial bleeding during the prior 12 months, known brain arteriovenous malformation, moderate or severe stroke during the 6 months, recent major surgery or trauma during the prior 30 days, and planned major surgery on dual antiplatelet therapy.

Minor criteria include being aged ≥75, moderate chronic kidney disease (estimated glomerular filtration rate 30–59 mL/min), mild anaemia (haemoglobin 110–129 g/L for men and 110–119 g/L for women), spontaneous bleeding requiring hospitalisation and/or transfusion 6–12 months prior to PCI, chronic non-steroidal anti-inflammatory drug or steroid use, and ischaemic stroke more than 6 months prior to PCI.

Patients are considered to be at high bleeding risk if at least one major criterion or two minor criteria are satisfied.

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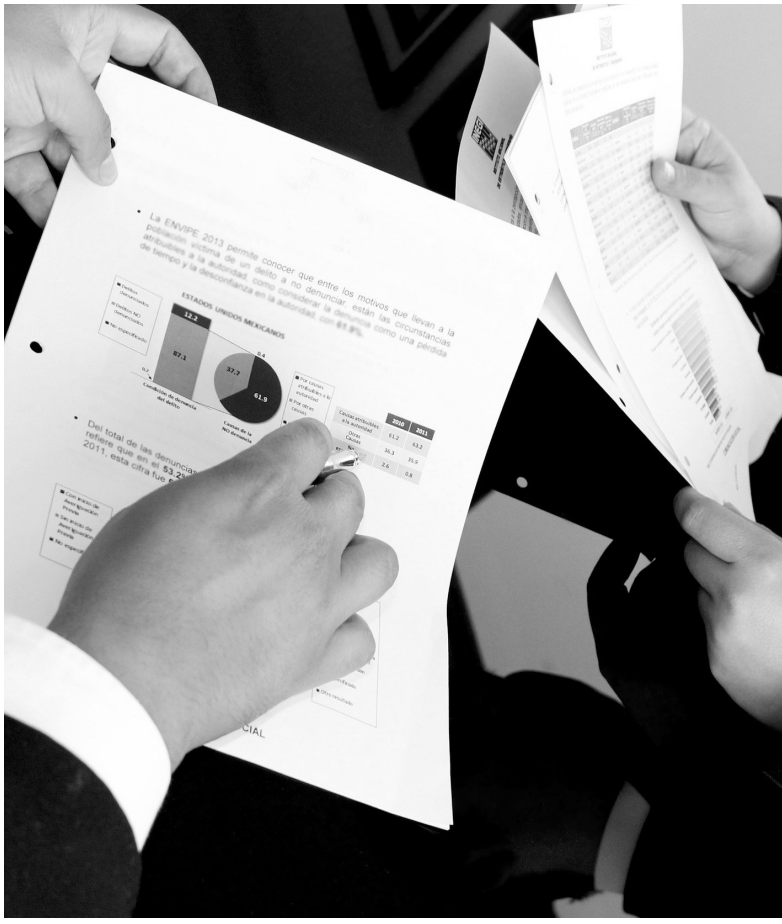
5

Data on the safety of paclitaxel for peripheral interventions and drug-coated balloons for coronary interventions.

Following the turmoil caused by a meta-analysis reporting increased death beyond 1 year with the use of paclitaxel-eluting stents or drug-coated balloons for peripheral vascular disease, a PCR statement looked into the details of the matter. According to Dr Lansky from Yale University School of Medicine, New Haven, Connecticut, USA, who presented the statement, the meta-analysis has a number of limitations that preclude the deduction of a clear message regarding paclitaxel-coated balloons, such as data being on the study (and not patient) level, high drop-out rates (>80% at 4–5 years), limited long-term data, problematic adjudication of causes of death, and corrections to the primary source data. Data from subsequent individual sponsor-driven analyses have contested the result of the meta-analysis. In conclusion, results from an adjudicated, industry-wide patient level pooled analysis are awaited to further clarify this controversy.

Regarding the use of drug-eluting balloons in the coronaries, Dr Jeger from University Hospital Basel, Basel, Switzerland, presented the angiographic results from the BASKET-SMALL 2 trial; in small coronary arteries (diameter: <3 mm) compared to drug-eluting stents, the use of a drug-eluting balloon resulted in a lower acute lumen gain and more residual stenosis. At follow-up after 1 year, the late lumen loss was similar for both groups, while eight thrombotic occlusions of the target lesions were noted in the stent group, as opposed to none in the balloon group. Dr Silverio from Uppsala University presented real-world data from the SCAAR registry regarding the treatment of small coronary vessels with drug-eluting balloons. After matching the patients treated with balloons to patients receiving a new-generation stent, drug-eluting balloons were associated with a higher risk of restenosis and myocardial infarction at 3-years follow-up compared to stents. Dr Vos from OLVG Hospital, Amsterdam, Netherlands, shared the results of the REVELATION trial, a small (N=120), prospective, randomised, controlled trial, where drug-eluting balloons were compared to stents in patients with ST-elevation acute myocardial infarction. Fractional flow reserve, late lumen loss, and major adverse cardiac events at 9 months did not differ between the two groups.



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30 Years of EuroPCR

On 21st May 2019, in the 17th arrondissement of Paris, France, the Palais des Congrès opened its doors to the 30th assembly of EuroPCR, hosting individuals from around the world with a keen curiosity for interventional cardiovascular medicine. What started in 1989 as a meeting between a few dozen people in the region of Occitaine, in the city of Toulouse, France, has grown significantly, with >11,000 participants attending the event in the country's capital this year.

Louise Rogers
Editorial Assistant

Though the scope and stature of the assembly has changed and expanded since the first meeting, which was named 'Complex Coronary Angioplasty and New Techniques in Interventional Cardiology', the fundamental message and mission that founders Prof Jean Marco and Dr Jean Fajadet set out to achieve has prevailed: to serve the needs and improve the lives of every patient by helping the cardiovascular community share knowledge, experience, and practice.

Prof Marco's avidity and commitment to exchanging medical wisdom began some time before the first meeting in Toulouse. After being appointed as a professor of cardiology in 1975, Prof Marco began to organise learning workshops, where healthcare professionals could share and debate medical cases through live demonstrations and daily case studies. His first live demonstration course took place in Toulouse, when 'innovation in education and sharing' was already his guiding principle. Over the following

years, the courses began to grow throughout France, each hosted by different directors, until one day in 1987, when Prof Marco and Dr Fajadet came together and co-founded the Interventional Cardiology Unit of the Clinique Pasteur-Toulouse. They shared a vision: "We are capable of building the best European annual course in the field of interventional cardiology. Let us commit ourselves with determination and passion to live this dream and drive our energy to succeed. It is a long-term vision; we have to work for our successors." That initial vision was the seed that would grow to become EuroPCR.

Following 1989, the course continued to expand and, in 1997, to accommodate the increased number of attendees, the newly renamed 'Endovascular Therapy Course', closed its doors in Toulouse and migrated north to its new home: Paris. The congress' first venue in Paris was situated on the banks of the Eiffel Tower. The move to a new city brought with it a new name and, in 2000, the 'Paris Course on Revascularisation' (the origin of PCR) was born, attracting 6,700 participants. A merger with the Rotterdam-based EuroCVS congress a year on added the prefix Euro and created the final name: EuroPCR. At a similar time, the congress took a digital shift and launched EuroPCRonline.

The last 9 years have seen the global expansion of EuroPCR. Before 2010, the congress grew rapidly, but the course was limited to inside the French borders. Since then, six new PCR courses have been initiated: AICT-AsiaPCR, the meeting for interventional cardiology in the Asia Pacific; PCR London Valves, the patient-orientated valve disease meeting; GulfPCR-GIM, the meeting for interventional cardiology in the Middle-East; AfricaPCR, addressing the specific needs for the African cardiovascular community; PCR-CIT China Chengdu Valves, the course for valve interventions in Greater China; and PCR Tokyo Valves, sharing best practice in valvular interventions in Japan and Asia. All international courses were initiated and built by the local practitioners and communities, thereby addressing the specific needs and issues in that area.

Today, EuroPCR has grown to accommodate >11,000 PCR participants worldwide, and sees >30,000 participants attending courses, seminars, and webinars around the world. The epic history of the event highlights the dedication cardiologists have to further advance the field of interventional cardiology, all with the same vision and the official PCR mission in mind: to serve the needs of each individual patient by helping the cardiovascular community to share knowledge, experience, and practice.[1]

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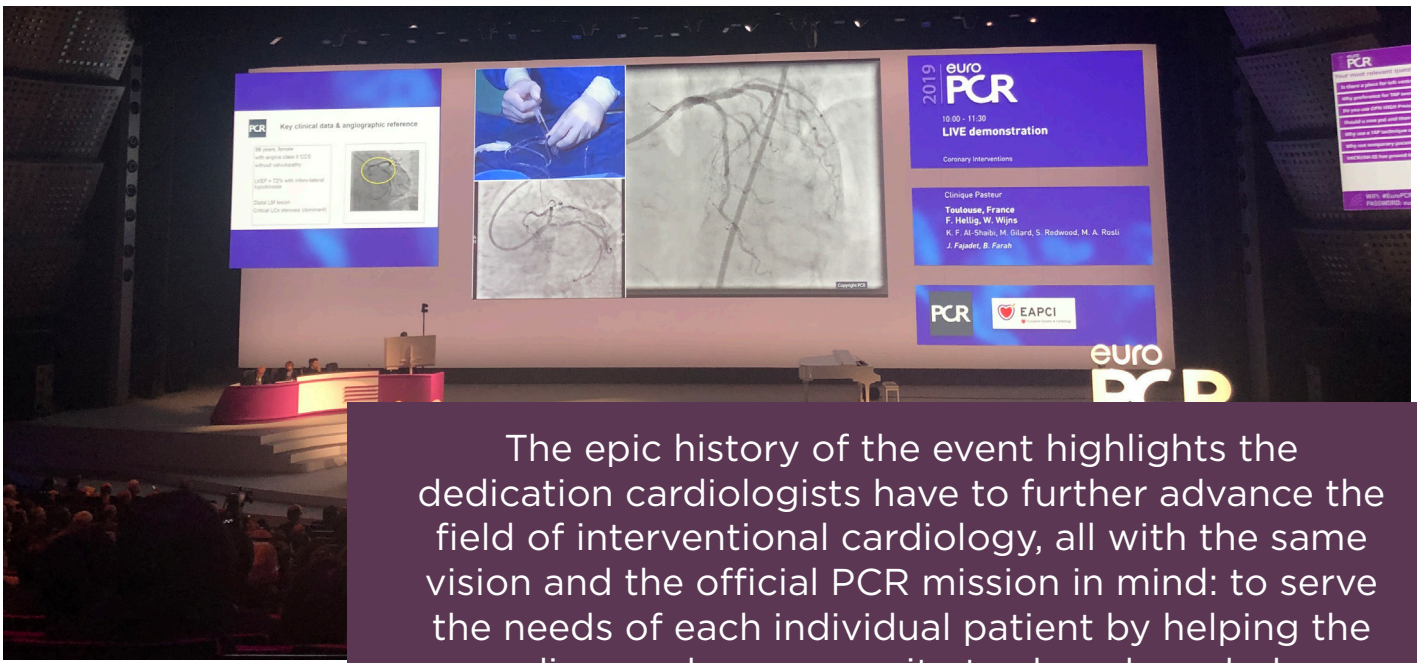


The epic history of the event highlights the dedication cardiologists have to further advance the field of interventional cardiology, all with the same vision and the official PCR mission in mind: to serve the needs of each individual patient by helping the cardiovascular community to share knowledge, experience, and practice.

Congress Interview

Prof Eduard Margetic

Clinical Hospital Center Zagreb, Croatia

"I remember when I first attended EuroPCR; I think it was under the Eiffel Tower in big white tents. It was really beautiful. "

We were honoured to meet with *EMJ Interventional Cardiology* Editorial Board member Prof Eduard Margetic at this year's EuroPCR congress to discuss all the latest findings from this exciting event. We met with him immediately following a fascinating session he chaired on STEMI complications.

Q1 Please can you briefly tell us about the session you chaired at EuroPCR?

The session was on STEMI complications, with the aim of seeing what type of complications can occur, how they can be treated, and how they can be avoided in the future. We had six cases presented, with presenters and session chairs from many countries, as well as a full audience, giving us a varied experience.

This is a type of session that people love because it shows the audience real-life scenarios, something you could encounter in your daily practice. It also highlights the differences between countries; some areas have access to different drugs and equipment, so it is always interesting to get a different perspective on how other centres are treating these complications.

Q2 How does EuroPCR differ from congresses you attend in Croatia?

Well, firstly, EuroPCR is a big congress, one of the biggest in the world for interventionalists and is held annually. In Croatia, we have a congress held every 2 years called CROINTERVENT. At this congress, we want to cover all elements of interventional cardiology, including live cases, because these present a much more hands-on experience than simply giving a lecture. While this congress is smaller than something like EuroPCR, it is still international, and we have colleagues travelling to attend from all over Europe, totalling around 300–400 participants.

I remember when I first attended EuroPCR; I think it was under the Eiffel Tower in big white tents. It was really beautiful. I wanted to see everything there was to see, but it just is not possible. You have to be selective and prioritise. There is so much quality material here, from the training village, to the announcement of new trials, to the smaller sessions on complications and so on. You can really tailor your EuroPCR experience. It is a must for interventional cardiologists.

Q3 You are the President of the Croatian Cardiac Society's interventional working group. Could you tell us about the aims of this working group and what you have achieved so far?

One of the main obligations is just to interact with colleagues and discuss the biggest needs for the future of the discipline. I have been President since 2015, before which we did not have a register for interventional cardiology; it had been planned for 20 years but never created. Now, we have created a central register for all 14 Croatian interventional centres. Being able to directly compare these centres via this registry is very useful, letting us identify differences throughout the country. We currently add data from about 50,000 patients per year, so we will soon have a large amount of very useful patient data at our disposal.

Q4 Are there any sessions here at EuroPCR that you are particularly excited to see? Do you think they will impact your practice?

The sessions on the next generation of devices are always exciting. We always think we have reached the technological peak and things cannot get better, but they can always be improved. Industry is currently working very hard to provide these improved options, especially for structural interventions. This type of intervention can be very costly, so there is constantly the question of striking the balance between the best possible treatment and the most cost-effective solution for your centre and patients. Mitraclip, for example, may be next and I am interested in learning more about its application and popularity. But we must also be wary of technology that seems revolutionary but does not last; I remember a long time ago that laser technology was very promising to cut through vessels, but these were big bulky devices and expensive. There are some technologies that could even be harmful for patients, so we must be careful what we adopt.

"We always think we have reached the technological peak and things cannot get better, but they can always be improved."

Large advances are also being made in pharmacology, with promising sessions on thrombotic and anticoagulant drugs, including their dosing and optimum combinations. Here too we have the question of money, because we have to identify those people who will benefit most from these new drugs, but there are sadly always more patients than there are finances available. So, I would say it is a constant struggle to try and break the barrier and find something new to benefit patients, usually in the form of a device or a drug, and then battle with the legislation to make it affordable.

Q5 When did you first know you wanted to become an interventional cardiologist?

I was interested in the intellectual part of medicine, the physical science, which continued for the first 2 years of my training as I learned more about basic science. But then I started to work in the clinic and realised I wanted to work with the patients. When I finished this aspect of my training, I wanted to bring both of these elements together and to have something both challenging intellectually but also requiring manual work. Interventional cardiology was the perfect match.

After medical school, I worked in the emergency department and outpatient department during the years of the war [Croatian War of Independence], before following the old programme to become a cardiologist, which required 4 years of internal medicine experience and 2 years of cardiology training. Nowadays you can specialise in this field much sooner, but I would dare to say that the old method gave people a broader knowledge than many of the specialists these days. Sometimes you cannot get to do what you want immediately, but I was lucky to have access to this field and I have been working in it for 25 years now. Yes, this discipline sometimes means you have to get up in the middle of the night to help a patient, but it is very rewarding and there is much satisfaction in this work.

Interviews

The European Medical Journal spoke to two session chairs at EuroPCR for their take on the current interventional cardiology landscape, as well as to learn more about their experiences and careers.

Maurizio Taramasso

University Hospital of Zurich, Switzerland

Q1

What first attracted you to a career as a cardiac surgeon?

Since the beginning of my medical studies I was fascinated by the cardiovascular system. Meeting Prof Maisano and Prof Alfieri during my clinical rotation had a great impact on my decision to pursue cardiac surgery.

Q2

How did it feel to be the first cardiac surgeon to win the Thomas J. Linnemeier Spirit of Interventional Cardiology Young Investigator Award?

It was totally unexpected and really exciting for me. However, this was just a starting point for me that acted as a stimulus to try to always do my best in the three areas that should characterise the profession of all physicians: the clinic, teaching, and research.

Q3

What are you most looking forward to about co-chairing the session 'All you need to know about tricuspid interventions' at EuroPCR this year?

The interest in the tricuspid field is growing really quickly. I am looking forward to sharing everything that I've learnt during the last few years, since tricuspid interventions have been my focus since the very beginning.

Q4 There is a lot of content at EuroPCR this year on tricuspid and mitral interventions. Is there a stand out session that you are excited to attend?

More than one! I would recommend the Learning Live sessions.

Q5 You recently co-authored the paper 'Tricuspid Regurgitation: Predicting the Need for Intervention, Procedural Success, and Recurrence of Disease.' What would you say is the take-home message from this paper?

The main message is that there is still a lot to learn, and therefore to do, in this field. We are far from having a precise understanding regarding patient selection, optimisation of the outcomes, and, moreover, increasing the awareness of tricuspid regurgitation in the cardiovascular 'not-interventional' community.

Q6 You have been involved in research involving robotics in mitral valve repair. How is robotics innovation changing the field of cardiac surgery?

I think robotics technology and artificial intelligence integrated with augmented reality will radically change what we are doing within the next 10–15 years: probably not in surgery, but definitely in most structural interventions.

Q7 Your mentor, Prof Francesco Maisano, played a large role in your professional development. How important do you think mentorship is within the medical community?

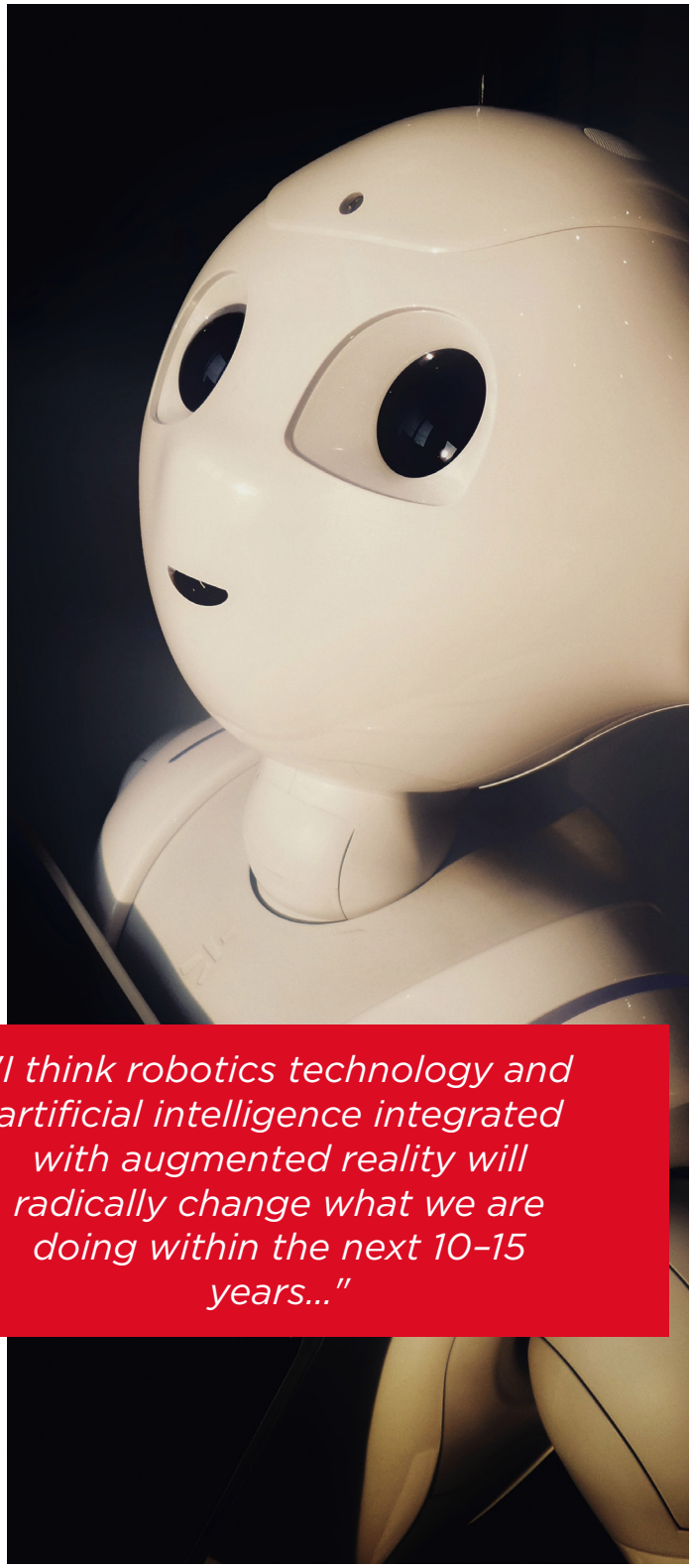
Mentorship is fundamental. I was really lucky to meet Prof. Maisano early in my career. He is an outstanding physician, researcher, innovator, and mentor. I can never stop thanking him; I'm learning something new every day, even after many years.

Q8 What is the most exciting innovation you have seen in your time as a cardiac surgeon?

The structural intervention revolution that gives us the chance to offer a real patient-tailored therapy.

Q9 What advice do you have for students looking to start a career as a cardiac surgeon?

It is exciting but hard. You need a lot of passion, but if you have it this is the most beautiful profession in the world.



"I think robotics technology and artificial intelligence integrated with augmented reality will radically change what we are doing within the next 10–15 years..."

Corrado Tamburino

University of Catania, Italy

Q1

With a career spanning three decades, you have undoubtedly seen numerous breakthroughs in the cardiological field. Can you comment on which of these have most impacted your work?

I have seen numerous breakthroughs during my professional life. Three of them in particular have primarily impacted my work: bare-metal stents, drug-eluting stents, and transcatheter aortic valve replacement (TAVR).

Initially, due to bare-metal stents and through the development of percutaneous coronary angioplasty, we observed enormous evolution and expansion of the interventional cardiology field. Years later, drug-eluting stents have dramatically reduced the rate of restenosis and massively expanded the spectrum of indications for percutaneous coronary interventions (PCI), including the treatment of left main coronary artery stenosis. In doing so, the approaches taken by many interventional cardiologists to these previously taboo subsets have changed. Additionally, the development and updating of guidelines for PCI has, without any doubt, considerably impacted global healthcare systems. Lastly, in my opinion the growth of TAVR has increased rapidly, albeit in a smaller population compared to PCI. It has become an accepted and even preferred alternative to surgical valve replacement for inoperable and high-risk patients, and it has dramatically influenced changes in my centre in terms of therapeutic approaches and organisational dynamics.

This technique has restored dignity to patients who cannot withstand an open-heart procedure due to the high surgical risk associated with their advanced age and facilitated the return to a more active lifestyle in this elderly population.

Q2

In 2008, you performed the first MitraClip implant for the treatment of mitral insufficiency. Why did you initially believe this innovation was necessary and, 11 years later, what do you believe its overall impact has been?

In 2008, I was really thrilled at the idea of treating mitral valve via a 'simple catheter'.

Based on my personal experience and data analysis, I realised that, unlike other technologies, transcatheter mitral valve interventions require future studies with a much larger number of patients to provide optimal treatment. Indeed, treatment of chronic mitral regurgitation ranges from management of the end-stage heart failure symptoms to percutaneous intervention in the earlier stages of the disease. The MitraClip repair system has been shown to be a noteworthy therapeutic option for patients with mitral valve regurgitation who are at prohibitive risk for a surgical repair, but further focussed clinical research is needed to standardise it and expand its indication to a larger proportion of patients in the future.

Q3

Interventional cardiology is a burgeoning field, with innovative ideas being continuously circulated. Do you believe that other therapeutic areas could benefit from an increased focus on developing interventional devices or treatment regimens?

The future of interventional cardiology lies in structural heart disease. Specifically, in the cardiology field, treatment of heart failure and atrioventricular valve disease will be the new frontier in percutaneous valve care in the years to come. I would not be surprised at all to

see microchips and interactive intracardiac or intravascular micropumps for the treatment of low cardiac output.

"In my opinion, bioabsorbable vascular scaffolds (BVS) are an exceptional technology that failed due to a mistake in market strategy..."

Q4 You have collaborated with various foreign universities and clinical centres, such as the University of Pitiè Salpetriere and the Parly-Grand Chesnay Medical-Surgical Centre in France. What are the main benefits of these partnerships, and do you believe they can apply to the field of interventional cardiology as a whole?

It has been a long time, about 30 years, since I worked abroad. In Paris, I was trained in the techniques of endomyocardial biopsy and mitral valvuloplasty, both of which are rarely performed today, the latter due to the dramatic decrease of patients affected by rheumatic disease in our population. My mentor, Dr Thierry Corcos from Parly-Grand Chesnay, trained me in coronary angioplasty and pushed me to perform interventions on challenging and complex anatomies that were treated with PCI by very few interventional cardiologists at the time. Today, all this belongs to the past, and over the years technological development has led us to face new challenges.

Q5 Advances in genomics are leading to the adoption of a more personalised approach to treating diseases. Do you believe this changes the way that researchers and clinicians develop interventional strategies that target various cardiological pathologies?

Genomics definitely represents a wide and interesting field of application, but I believe that we are still far from introducing it into interventional cardiology practice. I am sure, instead, that in the near future there will be extensive work done on atherosclerosis, hypertension, dyslipidaemia, and hopefully diabetes too.

Q6 You have communicated in or moderated for >600 national and international congresses. What do you believe makes EuroPCR stand out from the rest?

EuroPCR is very different from all other congresses because it aims at continuous education of attendees with the aim of enabling them to achieve high-quality, accurate, and regular work. It is a meeting in which individualism is banned and the common sense of belonging to a unique family aiming at a specific goal prevails. You must consider that we have been working for years on educating the new generations of young cardiologists who will eventually replace

"...the development and updating of guidelines for PCI has, without any doubt, considerably impacted global healthcare systems."

us with no jealousy on our part: this is the mission and priority of EuroPCR.

Q7 In regard to EuroPCR, you also helped develop the bioresorbable scaffolds course on PCR edu online. What do you believe are the main advantages that these scaffolds bring in comparison to commonly used stents, and are there challenges associated with their implementation?

In my opinion, bioabsorbable vascular scaffolds (BVS) are an exceptional technology that failed due to a mistake in market strategy: the immediate distribution of BVS, without a prior evaluation and restricted to few expert centres regarding the implantation technique and real world results, has led to implementation of these devices in an inconsistent manner. As a matter of fact, BVS use needs careful selection before its implementation. We have lost a great opportunity that I hope comes back. In my centre, we are now working on 5-year follow-ups for our patients, and I have been impressed to see coronary arteries free from any metallic frame: this represents a great benefit for patients.

Q8 What important lessons do you believe the research community has learned from the development of previous structural heart disease interventions (such as transcatheter aortic valve implantation, Mitraclip, and Parachute), and do these change the way researchers approach the creation of new innovations?

The answer is 'mistakes.' Confucius once said: "study the past to divine the future." Put simply, do not repeat the same errors. What has been done so far is necessary to move in the right direction, both in clinical and technical terms.

Q9 In terms of your professional life, what have been some of your most satisfying moments throughout your career in this field?

I have had a fulfilling career, especially because all my achieved goals were through the sweat of my own brow. My first great, satisfying moment was to get full professorship. In Italy, the average age of attaining a full professorship is around 55 years, so for me to attain this aged 41 was incredibly gratifying. Three years later I became Director of the Cardiology Division and Postgraduate School of Cardiology at the University of Catania, Sicily, Italy, and then Chief of the Cardio-Thorax Vascular and Transplant Department. From there, I was able to fulfil one of my main objectives: to create a school, to train and offer the most appropriate means and tools to young promising cardiologists, and to support them on their journey to becoming very capable and highly skilled specialists.

Q10 Finally, what advice would you give to your younger self as an aspiring practitioner in cardiology?

My advice to young cardiologists is to search for a highly qualified school, find the best mentor, and persevere with their efforts. In Europe, for interventional cardiologists, it is important to get in contact with successful leaders and experts who are enthusiastic about teaching and mentoring, and to learn from their guidance. It is also great to communicate with societies and organisations such as EuroPCR that focus their attention on patient care, continuous medical education, and specific training for young cardiologists. Cardiology is a broad field where everyone can find their place and satisfy their own ambitions. From arrhythmias to ischaemic cardiopathy; from structural heart disease, heart failure, and hypertension, to imaging and genomics: everyone can follow their own vocation.

"From arrhythmias to ischaemic cardiopathy; from structural heart disease, heart failure, and hypertension, to imaging and genomics: everyone can follow their own vocation."

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Abstract Reviews

Read about some of the top abstracts presented at the EuroPCR congress directly from the presenters themselves!

Revisiting the Use of the Provocative Acetylcholine Test in Chest Pain Patients with Non-Obstructive Coronary Arteries: 5-Year Follow-Up from the AChPOL Registry with a Special Focus on Patients with History of Myocardial Infarction with Non-Obstructive Coronary Arteries

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Disclosure: The authors have declared no conflicts of interest.

Keywords: Coronary microcirculation, microcirculation dysfunction, variant angina.

Citation: EMJ Int Card. 2019;7[1]:44-45. Abstract Review No. AR1

BACKGROUND

A significant proportion of patients undergoing coronarography due to chest pain have normal or near-to-normal coronary arteries.[1,2] The aim of this study was to assess the angiographic characteristics, efficacy, and safety of the provocative acetylcholine (ACh) test (AChT) in Central European patients with non-obstructive coronary arteries and its influence on further treatment. Additionally, the authors analysed the 5-year follow-up of this population with a special focus on patients with a history of myocardial infarction with non-obstructive coronary arteries (MINOCA).

METHODS

The AChPOL Registry is a prospective, ongoing, single-centre registry including patients undergoing AChT. From December 2010 to March 2013, the research team performed AChT in patients referred for further diagnostics with suspicion of variant angina or coronary microcirculation dysfunction based on the Coronary Vasomotion Disorders International Study Group (COVADIS) criteria.[3] ACh was injected in incremental doses of 25, 50, and 75 mg into the right coronary artery and 25, 50, and 100 mg into the left coronary artery. Patient progress was followed-up for 5 years.[4-6]

RESULTS

In total, 211 patients were enrolled from the AChPOL Registry. The mean age was 60.5±7.8 years, with women accounting for 67.8% of the study group. The ACh test revealed variant angina in 99 patients (46.9%), and coronary microcirculation dysfunction was seen in another 72 patients (34.1%). In patients with variant angina, characteristic spasm was most frequently observed in the left anterior descending artery (89.9%) and was most frequently diffuse (61.6%). The most common adverse events were a pause lasting >4 seconds (7.6%) and paroxysmal atrial fibrillation (0.9%). The most common calcium channel blockers prescribed in instances of test positivity were diltiazem (67.7%), amlodipine (27.3%), and verapamil (7.1%).

Patients with variant angina and coronary microcirculation dysfunction, compared to patients testing negatively to AChT, were younger (59.0±9.6 versus 58.4±8.9 versus 68.1±10.8 years; p=0.02), more often female (67.7% versus 83.3% versus 40.0%; p=0.03), presented more frequently with chest pain at rest (7.17% versus 61.1% versus 40.0%; p=0.02) and at night (62.6% versus 54.2% versus 22.5%), presented more frequently with thyroid dysfunction (23.2% versus 26.4% versus 2.5%; p=0.04), were smokers (22.2% versus 15.3% versus 5.0%; p=0.04), and had history of prior myocardial infarction (19.2% versus 31.9% versus 7.5%; p=0.04). However, patients with variant angina and coronary microcirculation dysfunction, when compared with patients with negative AChT, had less frequently positive exertional treadmill tests (43.4% versus 51.4% versus 77.5%; p=0.02), supraventricural premature beats (5.1% versus 5.6% versus 37.5%; p=0.01), atrial fibrillation (7.1% versus 5.6% versus 40.0%; p=0.02), and Type 2 diabetes mellitus (5.1% versus 5.6% versus 17.5%; p=0.04).

The median follow-up was 56 months (range: 48–60). In the microcirculation dysfunction subgroup, there was a significantly higher rate of recurrent chest pain requiring hospitalisation (hazard ratio [HR]: 2.76, 95% confidence interval [CI]: 1.45–3.52; p=0.01). Patients with a history of MINOCA also had higher rates of myocardial infarction (15.6% versus 4.2%, HR: 4.01, 95% CI: 1.08–14.86; p=0.02) and recurrent chest pain requiring hospitalisation (35.6% versus 10.8%, HR: 3.91, 95% CI: 1.65–9.29; p=0.01).

CONCLUSION

AChT is both effective and safe in the Central European population. In a 5-year follow-up, patients with recognised microcirculation dysfunction and MINOCA history characterised the highest risk of myocardial infarction or recurrent chest pain requiring hospitalisation.

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Rotational Atherectomy and Intravascular Lithotripsy for the Treatment of a Heavily Calcified Coronary Lesion

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Disclosure: The authors have declared no conflicts of interest.

Keywords: Calcified lesion, intravascular lithotripsy, rotational atherectomy.

Citation: EMJ Int Card. 2019;7[1]:46-47. Abstract Review No AR2.

INTRODUCTION

Suboptimal lesion preparation and consequent stent under-expansion related to calcified coronary lesions are predictors of adverse outcomes in terms of stent thrombosis and restenosis.[1] The authors present the case of a long and heavily calcified coronary stenosis treated with a combined approach using rotational atherectomy and intravascular lithoplasty to achieve an optimal lesion preparation allowing effective stent delivery and expansion.

CASE DESCRIPTION

A 71-year-old female with hypertension, dyslipidaemia, and diabetes, who is a current smoker and has a family history of coronary artery disease, was admitted to the authors' unit because of chronic stable angina. Stress echocardiography was positive (symptoms and significant electrocardiogram modifications). The left ventricle ejection fraction was normal (55%), but the inferior wall was akinetic. A coronary angiography was performed and revealed multivessel, heavily calcified coronary disease with chronic total occlusion of the right coronary artery and critical stenosis of proximal and mid left anterior descending artery (LAD) and of the mid-proximal left circumflex coronary artery (LCA). LAD percutaneous coronary intervention (PCI) was performed without problems in terms of balloon advancement and stent delivery and expansion (two drug-eluting stents [DES] were implanted on mid and proximal segments). The long (≥32 mm), calcified LCA lesions were scheduled for elective PCI the day after. Through the right radial approach, a 6F guiding catheter was used to selectively cannulate the left coronary ostium. Pre-dilatation using two different non-compliant (NC) balloons (2.5x20.0 mm and 3.0x15.0 mm inflated up to a pressure of 26 atm) was performed without obtaining a full and homogenous balloon expansion. Therefore, rotational atherectomy with a 1.5 mm burr at 180,000 rpm was performed to achieve plaque modification. However, the subsequent pre-dilatation using NC balloons (3.0x20.0 mm and 3.0x8.0 mm at 26 atm) was ineffective. An intravascular ultrasound (IVUS) scan showed circumferential, thick calcifications with persistent critical lumen area reduction on the mid segment. To tackle the undilatable lesion, a 3.0x12.0 mm percutaneous transluminal coronary angioplasty-lithoplasty balloon (Shock Wave, Shock wave Medical Inc., USA) was advanced at the lesion site, with the support of a second balance middle weight wire as a buddy wire, and inflated up to 6 atm. Next, five cycles of 10 pulses were delivered, achieving full balloon expansion and calcium disruption, as demonstrated by IVUS. A full and homogenous NC balloon (3.0x12 mm at 24 atm) expansion was then obtained and two overlapping DES (3.5x32 mm and 2.75x16 mm) were implanted and post-dilated obtaining satisfying angiographic and IVUS results.

DISCUSSION

In this case, two techniques of coronary calcium breakage were used complementarily: rotational atherectomy (by intimal calcium ablation) to enable initial lesion modification and ease the passage of balloon catheters and

intravascular lithotripsy (by intimal and medial calcium breakage) to allow the dilatation of a heavily calcified lesion.[2-4] The case showed that these two different tools to achieve heavily calcified lesion expansion could be used to obtain a good final result. However, specific studies are needed to assess the risks and benefits associated with the complementary use of both techniques in the setting of resistant calcified lesions.

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Twelve-Month Clinical Results from the Dedicated Bifurcation Cobalt-Chromium Sirolimus-Eluting Stent BiOSS LIM C® First-in-Man Registry

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Disclosure: Dr Gil is a Balton medical consultant. The other authors have declared no conflicts of interest.

Keywords: Coronary bifurcation, drug-eluting stent, left main stem.

Citation: EMJ Int Card. 2019;7[1]:47-48. Abstract Review No AR3.

BACKGROUND

The optimal approach to coronary bifurcations treatment by percutaneous coronary interventions is still a subject of debate and dedicated bifurcation stents are one of the proposed solutions.[1] The aim of this report was to present 12-month clinical results from the new dedicated bifurcation stent: sirolimus-eluting BiOSS LIM C® (Balton, Warsaw, Poland) Registry.

METHODS

The BiOSS LIM C® is a dedicated bifurcation balloon expandable stent made of cobalt-chromium (strut thickness of 70 µm). The stent releases sirolimus (1.4 µg/mm^2) from the surface of a biodegradable coating composed of a copolymer of lactic and glycolic acids. The degradation of the polymer lasts approximately 8 weeks. The BiOSS LIM C® stent consists of two main separate parts with different diameters: bigger proximally, and distally smaller. The proximal part is always shorter than the distal one (average of 1 mm). The ratio of the proximal part to the distal one varies between 1.15 and 1.30, ensuring physiological compatibility and optimal flow conditions. In the middle zone both parts are connected by two struts (2.0–2.4 mm in length after the BiOSS® stent implantation).[2-5]

Between August 2016 and December 2017, patients with stable coronary artery disease or non-ST-elevation acute coronary syndrome (NSTE-ACS) were enrolled into this multicentre registry. Main exclusion criteria were STE-ACS, bifurcations with Medina 0,0,1, serum creatinine level ≥2.0 mg/dL, inability to take dual antiplatelet therapy for 12 months, bifurcations with a

two-stent technique prior qualification to the treatment, as well as the lack of informed consent. Written, informed consent was obtained from all patients before cardiac catheterisation. An Institutional Review Board approved the study protocol (No 84/2016).

Provisional T-stenting was the obligatory strategy of the treatment. The primary endpoint was the cumulative rate of cardiac death, myocardial infarction (MI), and clinically-driven target lesion revascularisation (TLR) at 12 months.

RESULTS

A total of 95 patients with lesions in coronary bifurcations were enrolled (mean age 66.8±9.8 years; 17.9% female). There were 25.2% of patients with NSTE-ACS, 90.5% with hypertension, 33.7% with diabetes, 53.7% had previous MI, and 46.3% and 14.7% underwent prior percutaneous coronary intervention and coronary artery bypass graft, respectively. In most patients the target lesion was located in the left main (55.8%, n=53). It is worth stressing that true bifurcations were present in 52.6% (n=50) of patients.

The device success rate was 100.0%. The side branch was treated with an additional classical drug-eluting stent implantation in 18.9% of cases. The rate of the proximal optimisation technique was 53.7%, whereas the final kissing balloon inflation was performed in 29 patients (30.5%), reflecting a good result in the side branch after stenting.

The periprocedural MI (MI type 4a) was observed in four cases (4.2%). At 12 Months, the major adverse cardiovascular events rate was 9.5%: 1.1% cardiac death, 2.1% MI, and 6.3% clinically-driven TLR. All incidents, apart from one TLR, appeared in the left main subgroup. In case of TLR, two cases were treated with plain old balloon angioplasty, three with another drug-eluting stent, and one with coronary artery bypass graft.

CONCLUSION

Bifurcation treatment with a single dedicated bifurcation stent (BiOSS LIM C®) is feasible and highly successful (100.0% implantation rate). Twelve-month clinical results are promising, and long-term observations are pending.

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Aorto-Ostial Coronary Chronic Total Occlusions: Results and Technical Implications

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Disclosure: Dr Ojeda has received honoraria or consultation fees from Philips and Terumo. Dr Pan has received honoraria or consultation fees from Abbott, Philips, and Terumo. Dr Azzalini has received honoraria from Abbott, Terumo, Guerbet, and Sahajanand Medical Technologies, and research support from ACIST Medical System, Guerbet, and Terumo. The rest of the authors have declared no conflicts of interest.

Keywords: Aorto-ostial coronary chronic total occlusions, lesion subset, percutaneous coronary intervention.

Citation: EMJ Int Cardiol. 2019;7[1]:48-49. Abstract Review No. AR4.

AIMS

Percutaneous coronary intervention (PCI) of aorto-ostial coronary chronic total occlusion (CTO) can be a particularly challenging lesion subset due to the lack of antegrade support, proximal cap ambiguity, and unclear vessel course, among other factors. The aim of this study was to analyse the procedural aspects and outcomes of aorto-ostial CTO PCI.

METHODS AND RESULTS

All patients undergoing aorto-ostial CTO PCI between February 2013 and December 2018 at two high-volume centres with specialised CTO PCI programmes were included in this study. During this time, 1,053 CTO were percutaneously approached and 80 (7.6%) were aorto-ostial CTO. Aorto-ostial CTO location was considered if the proximal cap was within 5 mm of the aortocoronary ostium. Technical success was defined as residual stenosis <30% with thrombolysis in myocardial infarction 3 flow in the CTO vessel and procedural success as technical success plus the absence of in-hospital adverse events (all-cause death, Q-wave myocardial infarction, stroke, recurrent angina requiring target-vessel revascularisation with PCI or coronary artery bypass graft, and tamponade requiring pericardiocentesis or surgery). Major adverse cardiac events (MACE) on follow-up were defined as a composite of cardiac death, myocardial infarction, and clinical-driven target lesion revascularisation. A total of 80 patients were included. The mean age was 63±11 years, and 92.5% of the patients were male. The most frequent target CTO vessel was the right coronary artery (n=77, 96.2%). Three patients (3.7%) presented an occluded left main and one patient (1.2%) had a CTO of a circumflex artery with an independent ostium. The mean J-CTO score was 2.9±1.0 and 26 (32.5%) were flush ostial CTO (i.e., total absence of a stump). The access site was bifemoral or radial-femoral in 66 of the patients (82.5%). A retrograde approach was attempted in 59 of the patients (73.7%). Technical and procedural success were achieved in 61 (76.2%) patients. The most frequent successful crossing techniques were retrograde techniques: true-to-true in 12 patients (19.7%) and reverse controlled antegrade and retrograde tracking in 25 patients (41.1%) patients. In flush ostial CTO, retrograde techniques were the crossing technique in an even higher proportion of cases (n=15, 78.9% versus n=22, 52.4%, in flush versus no flush ostial CTO; p<0.01), without differences in the failure rate between both types of aorto-ostial CTO (26.9% versus 22.2%; p=nonsignificant). Reasons for failed recanalisation were the absence of interventional collaterals in 9 of 19 patients (47.4%), the presence of an impenetrable cap in 7 patients (36.8%), and the impossibility to advance the microcatheter through the collaterals after successful wiring in the remaining 3 (15.8%). On multivariable analysis, the only predictor of recanalisation failure was the absence of interventional collaterals (odds ratio [OR]: 15.49, 95% confidence interval [CI]: 3.01–79.85; p=0.001). Regarding in-hospital complications, five (6.2%) patients had a periprocedural non-Q wave myocardial infarction, two of whom had this in the context of a coronary perforation requiring intervention. Three (3.7%) coronary perforations were identified and resolved by covered stent implantation without cardiac tamponade. The rate of contrast-induced nephropathy was 5.0% and it was usually associated with other complications. After a median follow-up of 30 months, MACE rate was 11.2%. Two (2.5%) patients died from cardiovascular cause and seven (8.7%) needed repeat target vessel revascularisation.

CONCLUSIONS

Aorto-ostial CTO is a complex and challenging anatomic subset. In the authors' series, success rates were lower than those reported in contemporary registries in all-comers with CTO. Since a retrograde approach is usually required to cross the occluded segment, the presence of interventional collaterals seems to be key in the procedure success.

Impact of Right Ventricular Dysfunction on Outcomes after Transcatheter Edge-to-Edge Tricuspid Valve Repair: Results from the TRIVALVE Registry

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Disclosure: Dr Karam has received consultant fees from Abbott Vascular. Dr Braun has received speaker honoraria from Abbott Vascular. Dr Mehr has received travel grants by Bristol-Myer Squibb. Dr Nabauer has received speaker honoraria from Abbott Vascular. Prof Hausleiter has received research support and speaker honoraria from Abbott Vascular and Edwards Lifesciences. All other authors have declared no conflicts of interest.

Keywords: Kidney function, liver function, transcatheter edge-to-edge tricuspid valve repair (TTVR), tricuspid regurgitation (TR).

Citation: EMJ Int Cardiol. 2019;7[1]:50-51. Abstract Review No. AR5.

ABSTRACT

Tricuspid regurgitation (TR) is associated with right-heart venous congestion and reduced forward stroke volume, which contributes to renal dysfunction among patients with heart failure, and leads to perturbations in hepatic function, through so-called cardio-hepatic syndrome. Transcatheter edge-to-edge tricuspid valve repair (TTVR) for severe TR has emerged as a treatment option for patients ineligible for cardiac surgery. This study assessed the impact of TTVR on liver and kidney functions.

All patients undergoing tricuspid repair using the edge-to-edge repair technique (MitraClip®; Abbott Vascular, Santa Clara, California, USA) between March 2016 and June 2018 at Munich University Hospital, Munich, Germany, were included in the study. Kidney function was assessed using the estimated glomerular filtration rate (GFR). Patients requiring renal replacement therapy at baseline were excluded from the follow-up kidney function analysis. Liver function was assessed using aspartate transaminase (AST), alanine transaminase (ALT), gamma-glutamyl transpeptidase (gamma-GT), and bilirubin levels. Abnormal values were defined according to international standards as AST level >40 units per liter (U/L), ALT level >56 U/L, gamma-GT level >48 U/L, and bilirubin level >1.2 mg/dL.

Over the study period, 126 patients underwent TTVR for severe TR. Their mean GFR was 52.5 ±25.1 mL/min/1.73m^2, and 3 patients were on dialysis. They presented abnormal liver function with abnormal gamma-GT (251.8 ±275.0 U/L) and bilirubin (1.8±1.5 mg/dL) levels, while mean AST (43.8±23.7 U/L) and ALT level (26.2±30.5 U/L) were normal. Among patients who survived at 6-months, renal function tests remained stable, including among patients with moderate-to-severe chronic kidney disease (50 patients: mean GFR: 37.5 at baseline versus 40.1 mL/min/1.73m^2 at 6 months; p=0.39). Regarding liver function, a significant improvement was only observed in ALT level (30.7 U/L at baseline versus 24.9U/L at 6 months; p<0.001). When considering patients with abnormal liver function at baseline, improvement was also observed in terms of AST and bilirubin, with a reduction in AST level from 50.5 U/L to 39.9 U/L (p=0.02), and a reduction

in bilirubin level from 1.8 mg/dL to 1.5 mg/dL (p=0.03). There was no significant decrease in gamma-GT levels over the study period.

In conclusion, TR reduction by TTVR was associated with an improvement in liver function, mainly among patients with abnormal liver function at baseline, while kidney function remained stable. Accordingly, TTVR is an attractive option for patients presenting with severe TR and kidney or liver dysfunctions, who are at even higher surgical risks compared with patients who have normal kidney and liver functions.

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