Percutaneous Circulatory Assist Devices for High-Risk Coronary Intervention

Aung Myat, Niket Patel, Shana Tehrani, Adrian P. Banning, Simon R. Redwood, Deepak L. Bhatt

High-risk percutaneous coronary intervention reflects a multitude of patient, anatomic, and procedural characteristics that can increase risk. The relative inability to withstand the hemodynamic sequelae of ischemia, arrhythmia, reperfusion injury, or distal embolization of plaque serves as a common foundation for this patient cohort. This enhanced susceptibility to circulatory collapse has stimulated the development and use of the intra-aortic balloon pump, Impella, TandemHeart, and extracorporeal membrane oxygenation. The authors discuss the physiology underpinning their application. Thereafter, they appraise the evidence base investigating their use in high-risk coronary intervention to determine which patients might benefit most from their use.

SEE ADDITIONAL CONTENT ONLINE

Procedural Outcomes of Chronic Total Occlusion Percutaneous Coronary Intervention: A Report From the NCDR (National Cardiovascular Data Registry)

Emmanouil S. Brilakis, Subhash Banerjee, Dimitri Karmpaliotis, William L. Lombardi, Thomas T. Tsai, Kendrick A. Shunk, Kevin F. Kennedy, John A. Spertus, David R. Holmes, Jr, J. Aaron Grantham

Between July 1, 2009, and March 31, 2013, chronic total occlusion (CTO) percutaneous coronary intervention (PCI) represented 3.8% of the total PCI volume for stable coronary artery disease. CTO PCI was associated with lower procedural success (59% vs. 96%, p < 0.001) and higher major adverse cardiac event (1.6% vs. 0.8%, p < 0.001) rates. Multivariable analyses revealed several characteristics (older age, current smoking, previous myocardial infarction, previous coronary artery bypass graft, previous peripheral arterial disease, previous cardiac arrest, right coronary artery CTO target vessel, and less operator experience) associated with a lower likelihood of CTO PCI procedural success.

EDITORIAL COMMENT

Percutaneous Coronary Intervention for Chronic Total Occlusions: The Power of Negative Thinking

John A. Bittl
Coronary Computed Tomographic Prediction Rule for Time-Efficient Guidewire Crossing Through Chronic Total Occlusion: Insights From the CT-RECTOR Multicenter Registry (Computed Tomography Registry of Chronic Total Occlusion Revascularization)

Maksymilian P. Opolski, Stephan Achenbach, Annika Schuhbäck, Andreas Rolf, Helge Möllmann, Holger Nef, Johannes Rixe, Matthias Renker, Adam Witkowski, Cezary Kepka, Claudia Walther, Christian Schlundt, Artur Debski, Michal Jakubczyk, Christian W. Hamm

The multicenter CT-RECTOR (Computed Tomography Registry of Chronic Total Occlusion Revascularization) is a registry based on 240 consecutive chronic total occlusion (CTO) lesions with pre-procedural coronary computed tomography angiography (CCTA) data; it established a simple and accurate CCTA model for predicting successful guidewire crossing within 30 min through CTO. The proposed CCTA scoring system does not suffer from the limitations of conventional angiography and thus has the potential to exceed the discriminatory performance of the previously validated angiographic models. Clinicians may find the CT-RECTOR score particularly useful for predicting the time-efficient percutaneous revascularization and thus difficulty grading in CTO.

EDITORIAL COMMENT

Chronic Total Occlusion Percutaneous Coronary Intervention in 2014 Beyond the J-CTO Score (Japanese Multicenter CTO Registry): Chance Favors the Prepared Mind

Dimitrios Karmpaliotis, Philip Green

Long-Term Survival Benefit of Revascularization Compared With Medical Therapy in Patients With Coronary Chronic Total Occlusion and Well-Developed Collateral Circulation

Woo Jin Jang, Jeong Hoon Yang, Seung-Hyuk Choi, Young Bin Song, Joo-Yong Hahn, Jin-Ho Choi, Wook Sung Kim, Young Tak Lee, Hyeon-Cheol Gwon

Little is known about the clinical outcomes of patients with chronic total occlusion (CTO) and abundant collateral. Jang et al. analyzed data from 738 patients with at least 1 CTO and Rentrop 3 grade collateral. Patients who underwent revascularization and medical therapy (revascularization group) were compared with those who underwent medical therapy alone (medication group) in terms of cardiac death and major adverse cardiac events (MACE). During follow-up duration, the incidence of cardiac death and MACE were significantly lower in the revascularization group compared with the medication group. In patients with CTO and abundant collateral, aggressive revascularization may reduce the risk of adverse cardiac events.

EDITORIAL COMMENT

Are We Ready for a New Paradigm Shift in Percutaneous Revascularization of Chronically Occluded Vessels With Well-Developed Collaterals?

From Leaving ‘Em All to Stenting ‘Em All

Emanuele Barbato, William Wijns

CONTINUED ON PAGE A-24
Real-Time Ultrasound Guidance Facilitates Transradial Access: RAUST (Radial Artery Access With Ultrasound Trial)


The utility of routine ultrasound guidance for transradial cardiac catheterization was investigated in a multicenter randomized trial of 698 patients. Ultrasound guidance improved the first-pass success rate (64.8% vs. 43.9%, \( p < 0.0001 \)) and reduced the number of attempts required to access (1.65 vs. 3.05, \( p < 0.0001 \)), the time to achieve access (88 s vs. 108 s, \( p = 0.006 \)), and number of difficult procedures. Clinical complications, pain, and spasm were infrequent and comparable between the groups. These results demonstrate that ultrasound guidance improves the success and efficiency of transradial access.

Pre-Treatment With Glucagon-Like Peptide-1 Protects Against Ischemic Left Ventricular Dysfunction and Stunning Without a Detected Difference in Myocardial Substrate Utilization

Liam M. McCormick, Stephen P. Hoole, Paul A. White, Philip A. Read, Richard G. Axell, Sophie J. Clarke, Michael O’Sullivan, Nick E.J. West, David P. Dutka

It is recognized that the multiple episodes of supply ischemia that occur with balloon inflations during percutaneous coronary interventions result in stunning and cumulative left ventricular dysfunction. The cardioprotective properties of glucagon-like peptide-1 (GLP-1) may have potential as a therapeutic adjunct to support the heart during myocardial ischemia. However, mechanisms remain unclear. This study was therefore undertaken to provide some mechanistic insights into GLP-1-related cardioprotection. Specifically, the authors sought to determine whether pre-treatment with intravenous GLP-1(7-36) amide, commenced before an ischemic insult, protected the heart during percutaneous coronary intervention and whether it was associated with changes in the myocardial use of glucose.

EDITORIAL COMMENT

Prevention of Myocardial Stunning During Percutaneous Coronary Interventions: Novel Insights From Pre-Treatment With Glucagon-Like Peptide-1

Brigitta C. Brott
Inter-Core Lab Variability in Analyzing Quantitative Coronary Angiography for Bifurcation Lesions: A Post-Hoc Analysis of a Randomized Trial

Maik J. Grundeken, Yuki Ishibashi, Philippe Généreux, Laura LaSalle, Javaid Iqbal, Joanna J. Wykrzykowska, Marie-Angèle Morel, Jan G. Tijssen, Robbert J. de Winter, Chrysaﬁos Girasis, Hector M. Garcia-Garcia, Yoshinobu Onuma, Martin B. Leon, Patrick W. Serruys

Inter-core lab variability in quantitative coronary angiography analysis of bifurcation lesions between 2 core labs was evaluated before and after alignment of the used methodology. Before alignment, the mean difference between the core labs (bias) was large for all quantitative coronary angiography parameters with wide 95% limits of agreement. The bias of the in-segment percentage diameter stenosis of the side branch was 5.5% (95% limits of agreement: -26.7% to 37.8%). After reanalysis, the bias of the in-segment percentage diameter stenosis of the side branch reduced to 1.8% (95% limits of agreement: -16.7% to 20.4%). These findings emphasize the importance of using the same methodology among different core labs worldwide.

SEE ADDITIONAL CONTENT ONLINE

Health Status After Transcatheter Aortic Valve Replacement in Patients at Extreme Surgical Risk: Results From the CoreValve U.S. Trial

Ruben L. Osnabrugg, Suzanne V. Arnold, Matthew R. Reynolds, Elizabeth A. Magnuson, Kaijun Wang, Vincent A. Gaudiani, Robert C. Stoler, Thomas A. Burdon, Neal Kleiman, Michael J. Reardon, David H. Adams, Jeffrey J. Popma, David J. Cohen, on behalf of the CoreValve U.S. Trial Investigators

For many patients considering transcatheter aortic valve replacement (TAVR), improvement in quality of life may be of even greater importance than prolonged survival. In this single-arm trial, TAVR via the transfemoral approach with a self-expanding bioprosthesis resulted in substantial improvements in both disease-specific and generic health-related quality of life, but there remained a substantial minority of patients who died or had very poor quality of life despite TAVR. Predictive models based on a combination of clinical factors as well as disability and frailty may provide insight into the optimal patient population for which TAVR is beneficial.

SEE ADDITIONAL CONTENT ONLINE

CONTINUED ON PAGE A-26
Outcomes of Inoperable Symptomatic Aortic Stenosis Patients Not Undergoing Aortic Valve Replacement: Insight Into the Impact of Balloon Aortic Valvuloplasty From the PARTNER Trial (Placement of AoRtic TraNscathetER Valve Trial)


This study reports clinical outcomes of inoperable symptomatic patients undergoing balloon aortic valvuloplasty (BAV) in the PARTNER (Placement of AoRtic TraNscathetER Valves) trial. Three-month survival and quality of life at 1 month were better for patients undergoing BAV compared with medical management alone. This benefit, however, was short-lived with equal survival and quality of life at 1 year for patients with and without BAV. BAV for aortic stenosis patients who cannot undergo aortic valve replacement is a useful short-term palliative therapy.

Prosthetic Valve Endocarditis After Transcatheter Valve Replacement: A Systematic Review

Ignacio J. Amat-Santos, Henrique B. Ribeiro, Marina Urena, Ricardo Allende, Christine Houde, Elisabeth Bédard, Jean Perron, Robert DeLarochellière, Jean-Michel Paradis, Eric Dumont, Daniel Doyle, Siamak Mohammadi, Mélanie Côté, José Alberto San Roman, Josep Rodés-Cabau

The aim of this review is to describe the incidence, characteristics, predisposing factors, and outcomes of prosthetic valve endocarditis (PVE) after transcatheter aortic valve replacement (TAVR) or transcatheter pulmonary valve replacement (TPVR) through a systematic review of all published cases. A total of 60 patients (32 TAVRs, 28 TPVRs) were identified. PVE occurred more frequently among male patients, TAVR patients with very high baseline risk, and TPVR patients with a stenotic (vs. regurgitation) conduit/valve. Typical microorganisms of PVE were responsible for one-half of the cases, with enterococci and Staphylococcus aureus being predominant among TAVR and TPVR patients, respectively. Although most cases were “early infective endocarditis,” classic contaminant germs were found in <50% of TVR patients. Most TAVR patients were treated medically despite a high-rate of complications such as local extension, embolism, and heart failure, whereas most TPVR patients underwent surgery. The reported IE mortality rate was 34.4% and 7.1% in TAVR and TPVR patients, respectively.

SEE ADDITIONAL CONTENT ONLINE
PERIPHERAL

Early Experimental and Clinical Experience With a Focal Implant for Lower Extremity Post-Angioplasty Dissection

Peter A. Schneider, Robert Giasolli, Adrian Ebner, Renu Virmani, Juan F. Granada

The Tack-It device (Intact Vascular, Inc., Wayne, Pennsylvania) provides focal treatment of post-percutaneous transluminal balloon angioplasty (post-PTA) dissection of the lower extremity arteries and avoids the use of stents. Preclinical and first-in-human data are presented. Seven swine underwent superficial femoral artery device placement. Clinical study included 15 limbs with 25 lesions of the superficial femoral, popliteal, and tibial arteries. Tack-It caused less inflammation than stents in the preclinical study, reducing stenosis, neointimal thickness, and injury score. Post-PTA dissection was resolved in 100% of lesions with 83.3% 1-year angiographic patency. Tack-It minimized vessel injury in the preclinical study. Clinical use was safe and feasible, resulting in resolution of dissection without stent placement.

TRANSLATIONAL

Efficacy of Polymer Injection for Ischemic Mitral Regurgitation: Persistent Reduction of Mitral Regurgitation and Attenuation of Left Ventricular Remodeling

Xin Zeng, Lin Zou, Robert A. Levine, J. Luis Guerrero, Mark D. Handschumacher, Suzanne M. Sullivan, Gavin J.C. Braithwaite, James R. Stone, Jorge Solis, Orhun K. Muratoglu, Gus J. Vlahakes, Judy Hung

This study shows that localized polyvinyl-alcohol (PVA) injection has prolonged efficacy after injection into infarcted myocardium underlying the papillary muscles in a chronic ischemic mitral regurgitation (IMR) sheep model. It persistently reduces MR severity without MR recurrence, stabilizes the mitral valve-left ventricular (LV) spatial relationship, and more importantly attenuates LV remodeling and maintains LV systolic function over 8 weeks after PVA injection. These benefits are not observed in the sham-operated control group after only saline injection with the same follow-up period. These results suggest injection of PVA hydrogel into infarcted myocardium provides an alternative approach to the treatment of IMR with maintained efficacy over time.

EDITORIAL COMMENT

What to Do About Ischemic Mitral Regurgitation?

Michael Ragosta
When Collateral Damage Does Matter: Iatrogenic Ventricular Septal Rupture After Percutaneous Coronary Intervention of the Left Anterior Descending Artery
Vincent Michiels, Martin J. Swaans, Bastiaan J. Sorgdrager, Rolf F. Veldkamp, Robin H. Heijmen, Jurrien M. ten Berg

Transcatheter Closure of a Post-Myocardial Infarction Ventricular Septal Rupture Using a Parachute Device
Daxin Zhou, Wenzhi Pan, Lihua Guan, Cuizhen Pan, Junbo Ge

■ ONLINE FEATURE Avulsion of an Aortic Cusp During Aortic Balloon Valvuloplasty
Stavros Hadjimiltiades, Antonis Ziakas, George Kazinakis, Chrysovalantou Nikolaidou, Kyriakos Anastasiadis, Haralambos Karvounis

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Daniel García, Mohammad Ansari, Jaffid S. Majjul, Elman M. Urbina, Alexandre C. Ferreira, Cesar E. Mendoza

■ ONLINE FEATURE First Reported Use of the Repositionable Lotus Valve System for a Failing Surgical Aortic Bioprosthesis
Liam M. McCormick, Robert Gooley, Siobhan Lockwood, Ian T. Meredith

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Ahmed Farag, Yahya Al-najjar, Jonas Eichhöfer

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Mohamad Alkhouli, Irfan Shafi, Riyaz Bashir

■ ONLINE FEATURE Transcatheter Lotus Valve Implantation in a Degenerated Carpentier-Edwards Bioprosthesis
Nicolas M. Van Mieghem, Ramon Rodriguez-Olivares, Ben Ren, Mohamed Ouhlous, Tjebbe W. Galema, Marcel L. Geleinse, Arie-Pieter Kappetein, Peter P. de Jaegere

■ ONLINE FEATURE First-in-Man Use of Intravascular Near-Infrared Spectroscopy in the Carotid Arteries to Characterize Atherosclerotic Plaque Prior to Carotid Stenting
Ryan D. Madder, Amr E. Abbas, Robert D. Safian

■ ONLINE FEATURE Successful Repositioning of a Direct Flow Medical 25-mm Aortic Valve Replacement Procedure
Alexander Wolf, Thomas Schmitz, Azeem Latib, Christoph K. Naber

■ ONLINE FEATURE THESE ARTICLES DO NOT APPEAR IN THE PRINTED ISSUE. THEY ARE AVAILABLE IN THE ONLINE VERSION OF THIS ISSUE.
LETTER TO THE EDITOR

Valve Sizing for Pure Aortic Regurgitation During Transcatheter Aortic Valve Replacement: Deformation Dynamic of the Aortic Annulus in Different Valve Pathology May Be Different
Da Zhu, Wei Chen, Liqing Peng, Yingqiang Guo

EDITOR'S PAGE

Competency-Based Education
Spencer B. King III

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