**Circulation Topic Review**

*Circulation: Cardiovascular Interventions: 2013 Editors’ Picks*

The Editors

The following articles are being highlighted as part of *Circulation*’s Topic Review series. This series summarizes the most important manuscripts, as selected by the editors, published in *Circulation* and the *Circulation* subspecialty journals. The studies included in this article represent Editors’ Picks for each *Circulation: Cardiovascular Interventions* issue published in 2013. (*Circulation.* 2014;129:e331-e335.)

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**Staged Versus One-time Complete Revascularization With Percutaneous Coronary Intervention for Multivessel Coronary Artery Disease Patients Without ST-Elevation Myocardial Infarction**

Summary—There are evidence-based guidelines for staging of patients with ST-elevation myocardial infarction undergoing percutaneous coronary intervention, but we are not aware of any evidence comparing the strategy of complete revascularization with percutaneous coronary intervention in the index admission versus the strategy of staging in a subsequent admission for patients with coronary artery disease without ST-elevation myocardial infarction. Patients with coronary artery disease without ST-elevation myocardial infarction do not have significantly lower 3-year mortality rates with staged percutaneous coronary intervention than when they undergo complete revascularization in the index admission.

Conclusions—Patients with coronary artery disease without STEMI do not have significantly lower 3-year mortality rates with staged PCI than when they undergo CR in the index admission.1

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**Endovascular Treatment for Infrainguinal Vessels in Patients With Critical Limb Ischemia: OLIVE Registry, a Prospective, Multicenter Study in Japan With 12-Month Follow-up**

Summary—The optimal treatment of critical limb ischemia (CLI) is revascularization. Bypass surgery is an efficacious and durable revascularization strategy, but it is not suitable for all patients. Endovascular treatment (EVT) is an alternative first-line option for the treatment of CLI, but existing data on this therapy are limited by predominantly retrospective single-center studies with long recruitment periods. EVT outcomes in Japanese CLI patients with infrainguinal disease were elucidated in a prospective, multicenter, all-comers registry. Reintervention rates were high but wound healing was achieved within ≈3 months in half the patients and EVT overall achieved favorable outcomes.

Conclusions—The high reintervention rate notwithstanding, EVT was an effective treatment for Japanese critical limb ischemia patients with infrainguinal disease, with satisfactory AFS and major adverse limb event-free rates. The results of this study will be helpful for the future evaluation of critical limb ischemia therapy.2

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**Procedural Safety and Predictors of Acute Outcome of Intracoronary Administration of Progenitor Cells in 775 Consecutive Procedures Performed for Acute Myocardial Infarction or Chronic Heart Failure**

Summary—Cell-based therapies have demonstrated promising results after intracoronary administration in patients with acute or chronic ischemia. Intracoronary instrumentation is associated with a procedural risk of coronary injury. Intracoronary administration of bone marrow–derived cells with the stop-flow technique is as safe as a coronary angiogram in patients with acute myocardial infarction or chronic heart failure. Specific care has to be taken when infusing cells via the stop-flow technique into coronary bypass grafts.

Conclusions—Intracoronary infusion of progenitor cells can be performed with adequate safety in patients with acute myocardial infarction or CHF, because the safety profile was similar to what is usually expected from a coronary angiogram in the present cohort.3

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**Impact of Residual Chronic Total Occlusion of Right Coronary Artery on the Long-term Outcome in Patients Treated for Unprotected Left Main Disease: The Milan and New-Tokyo Registry**

Summary—The presence of chronic total occlusion of right coronary artery (CTO-RCA) may be associated with a worse clinical outcome in patients undergoing unprotected left main-percutaneous interventions attributable to more severe comorbidities. There is little data available regarding the impact of successful recanalization for CTO-RCA on long-term mortality in patients with unprotected left main. Cardiac-death occurred more frequently in patients with untreated CTO-RCA as compared with those with successfully recanalized CTO-RCA despite similar comorbidities, whereas in-stent restenosis occurred less frequently in patients with untreated CTO-RCA. An occluded RCA has negative impact on the long-term cardiac-mortality in patients undergoing unprotected left main-percutaneous interventions.

Conclusions—Cardiac-death occurred more frequently in patients with residual CTO-RCA as compared with those without residual

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CTO-RCA. These findings suggest that recanalization of CTO-RCA has significant impact on the long-term cardiac-mortality in patients undergoing ULM-percutaneous interventions probably by offering reserve coronary circulation, if in-stent restenosis were to occur in the treated left main.

**Fractional Flow Reserve Assessment of Left Main Stenosis in the Presence of Downstream Coronary Stenoses**

**Summary**—Fractional flow reserve (FFR) can be used to guide the decision for revascularization in the setting of intermediate left main coronary disease. The effect of downstream epicardial stenosis on the fractional flow reserve measurement of left main coronary lesions remains unclear. This study shows that a clinically relevant effect on the fractional flow reserve assessment of left main disease with the pressure wire in a nonstenosed downstream vessel occurs only when the stenosis in the other downstream artery is proximal and very severe.

**Conclusions**—A clinically relevant effect on the FFR assessment of left main disease with the pressure wire in a nonstenosed downstream vessel occurs only when the stenosis in the other vessel is proximal and very severe.

**Stroke After Primary Percutaneous Coronary Intervention in Patients With ST-Segment Elevation Myocardial Infarction: Timing, Characteristics, and Clinical Outcomes**

**Summary**—Stroke is an infrequent but potentially devastating complication of ST-segment elevation myocardial infarction treated with primary percutaneous coronary intervention (PCI). In the ST-segment elevation myocardial infarction population treated with primary PCI, the incidence, type, and timing of stroke, as well as subsequent clinical outcomes, have been understood. Data from the Assessment of Pexelizumab in Acute Myocardial Infarction (APEX-AMI) trial showed that stroke occurred in 1.3% of the patients treated with primary PCI, and stroke was associated with longer hospital stays, more hospital readmissions, and increased 90-day mortality. All hemorrhagic strokes occurred within 48 hours of primary PCI, whereas ischemic strokes tended to occur beyond 48 hours. Because most of the strokes occurred >48 hours after primary PCI, not all strokes after primary PCI seem to be procedure-related and, therefore, other mechanisms might be responsible for these late events.

**Conclusions**—Stroke is an infrequent complication in the setting of ST-segment elevation myocardial infarction treated with primary PCI but is associated with increased morbidity and mortality. Studies to determine mechanisms that may be responsible for strokes that occur >48 hours from primary PCI are warranted.

**Impact of Coronary Microvascular Function on Long-term Cardiac Mortality in Patients With Acute ST-Segment–Elevation Myocardial Infarction**

**Summary**—Microvascular function is increasingly recognized as an important marker of risk in coronary artery disease, and may be accurately assessed invasively by intracoronary Doppler flow velocity measurements. Microvascular function assessed by Doppler flow velocity is altered in the setting of ST-segment–elevation myocardial infarction, even in nonischemic regions remote from the infarcted myocardial tissue. Coronary flow velocity reserve in a reference vessel is a more selective marker of general microvascular function. Impaired coronary flow velocity reserve in a reference vessel is independently associated with an increased risk for long-term fatal cardiac events.

**Conclusions**—Microvascular dysfunction, measured by reference vessel CFVR determined after primary percutaneous coronary intervention for acute anterior wall ST-segment–elevation myocardial infarction is associated with a significantly increased long-term cardiac mortality.

**Assessment of Coronary Artery Stenosis by Coronary Angiography: A Head-to-Head Comparison With Pathological Coronary Artery Anatomy**

**Summary**—Conventional coronary angiography (CCA) is the gold standard for in vivo assessment of coronary arteries. The diagnostic accuracy of CCA is affected by many variables, including the orientation of the heart, angle selection for cardiac planes, and shape of the lesions. A head-to-head comparison of CCA with pathological coronary artery anatomy was performed in patients CCA before the heart transplantation. The accuracy of CCA for detecting coronary artery stenosis is high; however, the diagnostic ability is decreased in more severe and complex lesions, especially for distal segments.

**Conclusions**—The accuracy of CCA is quite high in detecting coronary artery stenosis in patients- and vessels-based levels. However, the diagnosis ability decreased in more severe and complex lesions, especially for distal segments.

**Transcatheter Aortic Valve Implantation for Patients With Severe Bicuspid Aortic Valve Stenosis**

**Summary**—Bicuspid aortic valve is considered an exclusion criterion in most clinical trials of transcatheter aortic valve implantation because of the risk of uneven expansion and subsequent malfunction of the bioprosthesis. Few data are available on the comparative feasibility and efficacy of transcatheter aortic valve implantation in bicuspid aortic valve. This article describes the results of transcatheter aortic valve implantation in bicuspid aortic valve patients who underwent systematic multidetector computed tomography before the procedure. In selected patients, transcatheter aortic valve implantation may be associated with low complication rate, therapeutic efficacy, and acceptable outcomes similar to those in nonbicuspid aortic valve patients.

**Conclusions**—In selected BAV patients, transcatheter aortic valve implantation may be associated with low complication rate, efficacy, and acceptable outcomes similar to those in non-BAV patients.

**Impaired Coronary Autoregulation Is Associated With Long-term Fatal Events in Patients With Stable Coronary Artery Disease**

**Summary**—Abnormalities in the function and structure of coronary microcirculation play an important role in the spectrum of ischemic heart disease. The functional status of microcirculation may accurately be evaluated by means of coronary flow (velocity)
measurements. Impaired coronary flow velocity reserve in unobstructed coronary arteries is associated with, predominantly nonfatal, adverse cardiac events. Impaired coronary flow velocity reserved in unobstructed coronary arteries in patients with stable coronary artery disease likely originates from disturbance of the coronary autoregulatory mechanism. Such disturbance is associated with an increased risk for long-term fatal (cardiac) events.

Conclusions—In patients with stable coronary artery disease, impaired refCFVR, resulting from increased baseline flow velocity indicating impaired coronary autoregulation, is associated with a significant increase in fatal events at long-term follow-up.  

Comparison of Bivalirudin and Radial Access Across a Spectrum of Preprocedural Risk of Bleeding in Percutaneous Coronary Intervention: Analysis From the National Cardiovascular Data Registry

Summary—Bleeding is a relatively common, morbid complication of percutaneous coronary intervention. Use of bivalirudin and femoral closure devices has been associated with reduced bleeding. Radial access lowers the rate of vascular and bleeding complications in percutaneous coronary intervention. Radial access is used infrequently in the United States (16.1% of all percutaneous coronary intervention). Observational analysis of bleeding avoidance strategies from a broadly representative contemporary CathPCI Registry. The combination of radial access and bivalirudin was associated with a significant reduction in postpercutaneous coronary intervention bleeding, as compared with the best practice of femoral access including use of bivalirudin and closure devices. In patients with radial access not exposed to IIb/IIIa inhibitors, the benefit of bivalirudin over heparin was still present, but very small. Patients at highest bleeding risk were least likely to receive radial access and bivalirudin.

Conclusions—In this observational analysis, the combination of bivalirudin and radial access was associated with reduced bleeding event rate. This benefit was present across the entire spectrum of preprocedural risk of bleeding, with or without exposure to IIb/IIIa inhibitors. These data support an adequately powered randomized trial comparing bleeding avoidance strategies.  

Endovascular Repair of Type B Aortic Dissection: Long-term Results of the Randomized Investigation of Stent Grafts in Aortic Dissection Trial

Summary—Short-term outcomes improve with endovascular management of complicated type B dissection. Long-term outcomes of uncomplicated (initially stable) type B dissection subjected to thoracic endovascular aortic repair are unknown. In survivors of type B dissection, thoracic endovascular aortic repair is associated with improved 5-year aorta-specific survival and delayed disease progression. In stable type B dissection with suitable anatomy, thoracic endovascular aortic repair should be considered to avoid late complications.

Conclusions—In this study of survivors of type B aortic dissection, TEVAR in addition to optimal medical treatment is associated with improved 5-year aorta-specific survival and delayed disease progression. In stable type B dissection with suitable anatomy, preemptive TEVAR should be considered to improve late outcome.  

Clinical and Procedural Characteristics Associated With Higher Radiation Exposure During Percutaneous Coronary Interventions and Coronary Angiography

Summary—There are risks of radiation exposure from fluoroscopy-guided procedures. The radial access route has become more popular for cardiac angiography. Contradictory results reported on increased radiation exposure when performed by the radial route. Identifies the clinical and angiographic factors related to increased radiation exposure. Demonstrates that radial access route is not necessarily associated with increased radiation exposure.

Conclusions—In the largest study population to assess radiation exposure, we found that high body mass index, history of coronary artery bypass graft surgery, number of treated lesions, and chronic total occlusions were associated with the highest patient radiation exposure. Radial access site was not associated with higher radiation exposure when compared with femoral approach.  

Sex-Related Differences in Outcomes After Transcatheter Aortic Valve Implantation: A Systematic Review and Meta-analysis

Summary—Transcatheter aortic valve implantation has been shown to improve symptoms and survival effectively in surgically high-risk patients with severe aortic stenosis but is associated with specific complications. Previous reports were considerably discrepant in terms of the sex-related differences in complication profiles and prognosis after transcatheter aortic valve implantation. This study systematically reviewed and pooled the currently published sex-specific data on outcomes after transcatheter aortic valve implantation. The pooled analyses suggested significant sex-related differences in this regard. Men were less likely to experience major/life-threatening bleeding and major vascular complications, but they had significantly higher risks for heart block requiring permanent pacemaker implantation and early as well as late deaths after transcatheter aortic valve implantation.

Conclusions—Although men had lower risks for major/life-threatening bleeding and major vascular complications after transcatheter aortic valve implantation, they had less favorable short-term and midterm survival.  

Effect on Platelet Reactivity From a Prasugrel Loading Dose After a Clopidogrel Loading Dose Compared With a Prasugrel Loading Dose Alone: Transferring From Clopidogrel Loading Dose to Prasugrel Loading Dose in Acute Coronary Syndrome Patients (TRIPLET): A Randomized Controlled Trial

Summary—Patients with acute coronary syndrome and planned for percutaneous coronary intervention are often administered a loading dose of clopidogrel before reaching the cardiac catheterization laboratory, but based on the results of TRial to Assess Improvement in Therapeutic Outcomes by Optimizing Platelet InhibitorsN with Prasugrel-Thrombolysis In Myocardial Infarction (TRITON-TIMI 38), interventional cardiologists may prefer that these patients be treated with prasugrel. Pharmacodynamic data for transitioning directly from a clopidogrel loading dose to a prasugrel loading dose
were not available. This study shows that administering a prasugrel loading dose ≤24 hours of a clopidogrel loading dose resulted in platelet reactivity (as measured by VerifyNow P2Y12 Reaction Units) that was not different compared with that with a prasugrel loading dose alone.

Conclusions—Platelet reactivity with prasugrel 60 mg LD added to clopidogrel 600 mg LD was not significantly different compared with prasugrel 60 mg LD alone in acute coronary syndrome patients undergoing percutaneous coronary intervention.16

Outcomes of Transcatheter and Surgical Aortic Valve Replacement in High-Risk Patients With Aortic Stenosis and Left Ventricular Dysfunction: Results From the Placement of Aortic Transcatheter Valves (PARTNER) Trial (Cohort A)

Summary—Left ventricular dysfunction is associated with adverse outcomes after surgical aortic valve replacement, but little is known about the impact of left ventricular ejection fraction on outcomes after transcatheter aortic valve replacement. Data from nonrandomized analyses suggest that transcatheter aortic valve replacement is associated with superior postoperative left ventricular ejection fraction recovery compared with surgical aortic valve replacement; however, significant differences in patient characteristics make such nonrandomized comparisons difficult to interpret. Within the Placement of Aortic Transcatheter Valves (PARTNER) trial, left ventricular dysfunction does not impact rates of all-cause mortality after either surgical aortic valve replacement or transcatheter aortic valve replacement. Within a randomized comparison of surgical aortic valve replacement and transcatheter aortic valve replacement, the rate and degree of left ventricular functional recovery was equivalent between both treatment modalities. Higher baseline left ventricular ejection fraction, low mean aortic valve gradient, and previous permanent pacemaker were each independently associated with reduced odds of early left ventricular functional recovery.

Conclusions—In high-risk patients with severe aortic stenosis and LV dysfunction, mortality rates and LV functional recovery were comparable between valve replacement techniques. TAVR is a feasible alternative for patients with symptomatic severe aortic stenosis and LV dysfunction who are at high risk for SAVR.16

Hemodynamic Response to Intravenous Adenosine and Its Effect on Fractional Flow Reserve Assessment: Results of the Adenosine for the Functional Evaluation of Coronary Stenosis Severity (AFFECESTS) Study

Summary—Fractional flow reserve (FFR) has been shown to be effective at reducing the rate of stent implantation and improving cardiac outcomes compared with angiographic guidance alone. Clinical trial data are almost exclusively based on FFR values measured during maximal steady-state hyperemia induced by intravenous adenosine infusion. Intravenous adenosine results in variable and unpredictable changes in systemic blood pressure. Measuring FFR prior to attainment of maximal steady-state hyperemia can lead to changes in clinical decision making. FFR during maximal steady-state hyperemia may be numerically higher than at other times during measurement. Using intravenous adenosine, on average it takes 260 seconds to achieve stable pressure conditions suitable for measurement of FFR. The heterogeneous hyperemic response of adenosine compounds suggests that new agents with vastly different pharmacological profiles (such as regadenoson) will need further evaluation in clinical outcome trials prior to adoption into routine clinical practice.

Conclusions—Intravenous adenosine results in variable changes in systemic blood pressure, which can lead to alterations in FFR lesion classification. Attention is required to ensure FFR is measured under conditions of stable hyperemia, although the FFR value at this point may be numerically higher.17

Preoperative Statins and Limb Salvage After Lower Extremity Revascularization in the Medicare Population

Summary—The use of statin therapy preoperatively is associated with reduced postoperative cardiovascular events. Preoperative statin therapy reduces all-cause mortality in patients with peripheral vascular disease undergoing major noncardiac vascular surgery. Identifies that preoperative statins are associated with improved 1-year limb salvage for patients undergoing peripheral vascular interventions. Demonstrates that statin therapy is underused among patients with PAD undergoing peripheral interventions in the US Medicare population.

Conclusions—Preoperative statins were associated with improved 1-year limb salvage after lower extremity revascularization. The strongest association was found for patients with the diagnosis of claudication. Statins seem to be underused among Medicare patients with peripheral artery disease. Further evaluation of the use of preoperative statins and the potential benefits for peripheral vascular interventions is warranted.18

References


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