Clinical and Angiographic Risk Stratification and Differential Impact on Treatment Outcomes in the Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI 2D) Trial

Summary—In this report, we examine angiographic and clinical risk scores in the Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI 2D) trial to test the hypothesis that differences in the end points of death and myocardial infarction and the composite end points of death/myocardial infarction/stroke and cardiac death/myocardial infarction observed between coronary revascularization and intensive medical therapy might be related to coronary disease extent and clinical characteristics. In the group of patients in whom percutaneous coronary intervention was chosen as the preferred revascularization option, there were no treatment differences between an initial strategy of percutaneous coronary intervention or intensive medical therapy regardless of angiographic or clinical risk score. This was not the case in the patients in whom coronary artery bypass graft surgery was selected as the preferred revascularization option because there was an increasing benefit of coronary artery bypass graft surgery in terms of reduction of cardiac end points in the highest-angiographic-risk patients, particularly in those with high clinical risk scores. Our findings indicate that among patients with diabetes mellitus and stable ischemic heart disease, a strategy of prompt coronary artery bypass graft surgery is preferred to an initial strategy of intensive medical therapy for those with extensive coronary artery disease or impaired left ventricular function to reduce the rates of myocardial infarction and death/myocardial infarction/stroke.

Conclusions—Among patients with diabetes mellitus and stable ischemic heart disease, a strategy of prompt coronary artery bypass graft surgery significantly reduces the rate of death/myocardial infarction MI/stroke in those with extensive coronary artery disease or impaired left ventricular function.1

A Prospective, Randomized Clinical Trial of Hemodynamic Support With Impella 2.5 Versus Intra-Aortic Balloon Pump in Patients Undergoing High-Risk Percutaneous Coronary Intervention: The PROTECT II Study

Summary—Complex percutaneous coronary intervention with hemodynamic support may offer an effective therapy for high-risk patients with multivessel or unprotected left main lesions. In the PROTECT II trial we randomly assigned 452 high-risk patients undergoing percutaneous coronary intervention to hemodynamic support with intra-aortic balloon counterpulsation or a percutaneous (Impella 2.5) axial flow left ventricular assist device. Primary outcome was incidence of major adverse events at 30 days with prospectively planned follow-up to 90 days. The trial was able to enroll the most ill population of symptomatic ischemic heart disease patients ever enrolled in a percutaneous coronary intervention trial. These patients were highly symptomatic, 66% were in New York Heart Association class III or IV, 87% had a history of heart failure, 51% had diabetes mellitus, 26% had renal insufficiency, and ejection fraction was 24%. Despite these extreme risk features, the reported 30-day mortality of 6.7% is comparable to predicted surgical models. Angiography success was high, whereas stroke/transient ischemic attack and incidence of renal failure rates were low. At 90 days follow-up, 68% of patients had improvement in symptom status with 74% of patients either class I or class II. The trial was terminated prematurely because of the data safety monitoring board's determination of futility. At 30 days, no difference in incidence of major adverse events occurred for either intent-to-treat or per protocol analysis. Planned follow-up at 90 days reveals a strong trend of benefit for Impella-treated patients (P=0.066, intent-to-treat) and significant for patients who actually qualified (P=0.023, per protocol).

Conclusions—The 30-day incidence of major adverse events was not different for patients with IABP or Impella 2.5 hemodynamic support. However, trends for improved outcomes were observed for Impella 2.5—supported patients at 90 days.2

Should We Emergently Revascularize Occluded Coronaries for Cardiac Arrest?: Rapid-Response Extracorporeal Membrane Oxygenation and Intra-Arrest Percutaneous Coronary Intervention

Summary—Cardiac arrest is a major cause of unexpected death. Despite cardiopulmonary resuscitation (CPR), only a few patients who suffer cardiac arrest are able to return to their former lifestyles. Extracorporeal CPR, an alternative CPR method in which extracorporeal membrane oxygenation (ECMO) is used, has been reported to be effective for patients in whom conventional CPR cannot achieve the return of spontaneous circulation. Venoarterial ECMO in patients undergoing cardiac arrest provides adequate...
temporal perfusion to the organs before the return of spontaneous circulation. A high incidence of acute coronary syndrome is reported in cardiac arrest patients, and the use of percutaneous coronary intervention (PCI) in postresuscitation care has recently been noted to improve the outcomes of such patients. We therefore investigated the associations among extracorporeal CPR, intra-arrest PCI, and patient outcomes. In this study, rapid-response ECMO was performed in 86 patients with acute coronary syndrome who were unresponsive to conventional CPR. The study patients were usually thought to have unfavorable prognosis when treated with conventional CPR. However, we obtained encouraging results: 89% of the study patients achieved return of spontaneous heartbeat, 46% were weaned from ECMO, 25% had a 30-day survival, and 19% had favorable neurological findings at the time of hospital discharge. This study showed a definitively higher rate of return of spontaneous heartbeat (100%) and improved outcomes in cardiac arrest patients with acute coronary syndrome treated with ECMO and intra-arrest PCI. PCI is feasible in this setting and can increase return of spontaneous heartbeat and improve outcomes. Randomized studies of intra-arrest PCI based on these findings are needed.

Conclusions—Rapid-response ECMO plus intra-arrest PCI is feasible and associated with improved outcomes in patients who are unresponsive to conventional cardiopulmonary resuscitation. On the basis of these findings, randomized studies of intra-arrest PCI are needed.3

Risk of Elective Major Noncardiac Surgery After Coronary Stent Insertion: A Population-Based Study

Summary—For patients with coronary stents, practice guidelines recommend that elective noncardiac surgery be delayed until surgery can be performed safely using antiplatelet therapy with aspirin alone. The suggested delay is 30 to 45 days for bare-metal stents and 1 year for drug-eluting stents. However, these recommendations are largely based on expert opinion and limited data. We therefore conducted a population-based cohort study in Ontario, Canada to describe the risks of major elective noncardiac surgery after stent implantation. After linking population-based administrative databases to a province-wide coronary stent registry, rates of 30-day major adverse cardiac events (mortality, readmission for acute coronary syndrome, repeat coronary revascularization) were measured among patients who underwent major elective noncardiac surgery from 2003 to 2008 after previous stent implantation. We found that when the interval between stent implantation and surgery was <45 days, event rates were high for bare-metal (6.7%) and drug-eluting (20.0%) stents. When the interval was 45 to 180 days, the event rate for bare-metal stents was 2.6%, which approached that of nonrevascularized individuals with Revised Cardiac Risk Index scores of 1 to 2. Adjusted analyses suggested this event rate increased further if this interval exceeded 180 days. For drug-eluting stents, the event rate was 1.2% once the interval exceeded 180 days, approaching that of nonrevascularized individuals with Revised Cardiac Risk Index scores of 1. These results suggest that the earliest optimal time for performing major elective noncardiac surgery is 46 to 180 days after bare-metal stent implantation and >180 days after drug-eluting stent implantation.

Conclusions—The earliest optimal time for elective surgery is 46 to 180 days after bare-metal stent implantation or >180 days after drug-eluting stent implantation.4


Summary—Several recent randomized trials comparing everolimus-eluting stents (EES) and sirolimus-eluting stents (SES) reported similar outcomes. However, only 1 trial was powered for a clinical end point, and no trial was powered for evaluating target-lesion revascularization. Randomized Evaluation of Sirolimus-eluting versus Everolimus-eluting stent Trial is a prospective multicenter randomized, open-label trial comparing EES with SES in Japan. The trial was powered for evaluating noninferiority of EES relative to SES in terms of target-lesion revascularization. From February and July 2010, 3197 patients were randomly assigned to receive either EES (1597 patients) or SES (1600 patients). At 1 year, the primary efficacy end point of target-lesion revascularization occurred in 65 patients (4.3%) in the EES group, and in 76 patients (5.0%) in the SES group, demonstrating noninferiority of EES to SES (Pnoninferiority<0.0001, and Psuperiority=0.34). Cumulative incidence of definite stent thrombosis was low and similar between the 2 groups (0.32% versus 0.38%; P=0.77). One-year clinical and angiographic outcome after EES implantation was noninferior to and not different from that after SES implantation in a stable coronary artery disease population with relatively less complex coronary anatomy. One-year clinical outcome after both EES and SES use was excellent with a low rate of target-lesion revascularization and a very low rate of stent thrombosis. Clinical follow-up will be continued up to 3 years. Future studies comparing different drug-eluting stents should focus more on patients with complex coronary artery disease to discern meaningful differences in safety and efficacy outcomes.

Conclusions—One-year clinical and angiographic outcome after EES implantation was noninferior to and not different from that after SES implantation in a stable coronary artery disease population with relatively less complex coronary anatomy. One-year clinical outcome after both EES and SES use was excellent with a low rate of target-lesion revascularization and a very low rate of stent thrombosis.5

Left Bundle-Branch Block Induced by Transcatheter Aortic Valve Implantation Increases Risk of Death

Summary—Transcatheter aortic valve implantation (TAVI) has proved to be a valuable treatment in patients with severe, symptomatic aortic valve stenosis who do not qualify for surgery. The TAVI procedure is frequently complicated by new-onset left bundle-branch block (LBBB). Although this complication has been addressed in TAVI literature, no attention has been paid to its clinical relevance, despite ample evidence of unfavorable outcome in other patient populations. Our multicenter study, comprising 679 TAVI patients from 8 centers in the Netherlands, convincingly shows that TAVI-induced LBBB is one of the strongest predictors of all-cause mortality. The observed ≈60% increase in mortality caused by TAVI-induced LBBB suggests that the benefit of valve repair is largely neutralized when LBBB develops. Mortality risk of LBBB was independent of the device type used; however, the incidence of LBBB was >4 times higher with the use of the Medtronic CoreValve System device than with the Edwards SAPIEN device (51% versus 12%). This is the first study indicating the considerable importance of LBBB in the outcome of TAVI patients. More attention should be paid to avoiding LBBB in TAVI procedures, both by implanters and by vendors of TAVI devices. With an approximately 50% rate of LBBB and an approximately 20%
rate of permanent pacemaker implantations, the studied Medtronic CoreValve System prostheses (until 2010) performed significantly worse than the Edwards SAPIEN devices with regard to both patient outcome and healthcare costs. LBBB should be regarded as a serious adverse event when evaluating new TAVI devices.

Conclusions—All-cause mortality after TAVI is higher in patients who develop LBBB than in patients who do not. TAVI-induced LBBB is an independent predictor of mortality.6

Clinical Features, Management, and Prognosis of Spontaneous Coronary Artery Dissection

Summary—Spontaneous coronary artery dissection is an infrequent but increasingly recognized cause of acute coronary syndrome. Although it is a nonatherosclerotic condition, its origin is unknown. This retrospective single-center study evaluated clinical features, associations, management strategies, and early and late outcomes in 117 762 patient-years of follow-up showed that DES are highly efficacious at reducing the risk of target-vessel revascularization without causing an increase in any safety outcomes, including stent thrombosis. However, among the DES types, there were considerable differences, such that the everolimus-eluting stent, sirolimus-eluting stent, and zotarolimus-eluting Resolute stent were the most efficacious and the everolimus-eluting stent was the safest stent.8

Impact of the Presence and Extent of Incomplete Angiographic Revascularization After Percutaneous Coronary Intervention in Acute Coronary Syndromes: The Acute Catheterization and Urgent Intervention Triage Strategy (ACUITY) Trial

Summary—The prevalence and clinical significance of incomplete coronary revascularization (ICR) in patients with acute coronary syndromes treated with percutaneous coronary intervention (PCI) are unknown. Prior studies have reported conflicting data owing to the lack of randomized clinical trial data, varying definitions of ICR, and substantial baseline differences between patients in whom complete revascularization is versus is not achieved. In the present study, using the large-scale Acute Catheterization and Urgent Intervention Triage Strategy (ACUITY) trial database, ICR after PCI was variably defined if any lesion with diameter stenosis cutoffs ranging from ≥30% to ≥70% with reference vessel diameter ≥2.0 mm (assessed at an independent angiographic core laboratory) remained after PCI. The prevalence of ICR after PCI varied widely from 17% to 75% of patients, depending on the threshold of angiographic percent diameter stenosis used to define ICR. Regardless of the threshold percent diameter stenosis used to define ICR, the presence of ICR after PCI was strongly associated with 1-year major adverse cardiovascular events, driven by increased rates of myocardial infarction and ischemia-driven unplanned repeat revascularization in patients with ICR, with numerically greater but nonsignificantly different rates of mortality. Thus, a strong relationship between ICR and major adverse cardiovascular events exists after PCI in acute coronary syndromes. A large-scale, randomized trial is thus warranted and required to determine whether a complete revascularization strategy (either single procedure or staged) is capable of reducing MACE compared with a selective ICR approach (whether angiographically or functionally guided) in acute coronary syndromes.

Conclusions—Depending on the threshold of percent diameter stenosis, ICR was present in 17% to 75% of patients with acute coronary syndromes after percutaneous coronary intervention. Regardless of the threshold, ICR was strongly associated with 1-year major adverse cardiovascular events.

Long-Term (>10 Years) Clinical Outcomes of First-in-Human Biodegradable Poly-l-Lactic Acid Coronary Stents: Igaki-Tamai Stents

Summary—The Igaki-Tamai stent is the first-in-man fully biodegradable coronary stent made of poly-l-lactic acid (PLLA). In the present
study, there was a high survival rate free of cardiac death (98% at 10 years) demonstrating the long-term safety of this stent. In the intravascular ultrasound echogenicity analysis, the Igaki-Tamai stent required 3 years to disappear from human coronary arteries. During the process of biodegradation (1–3 years), target lesion revascularization and target vessel revascularization reached a near plateau, suggesting that the process of PLLA biodegradation does not correlate with increased risk of clinical events. Although the mechanism of vessel healing in a chronic phase may not be the same between Igaki-Tamai stents and bioabsorbable drug-eluting PLLA stents, our study is essential in paving the way for a bioabsorbable drug-eluting PLLA stent, especially from the standpoint of long-term safety.

Conclusions—Acceptable major adverse cardiac events and scaffold thrombosis rates without stent recoil and vessel remodeling suggested the long-term safety of the Igaki-Tamai stent.10

Late Results of Percutaneous Mitral Commissurotomy up to 20 Years: Development and Validation of a Risk Score Predicting Late Functional Results From a Series of 912 Patients

Summary—Percutaneous mitral commissurotomy is the reference treatment for mitral stenosis in young patients with favorable valvular anatomy. Less favorable presentations are frequently encountered in Western countries. The evaluation of long-term functional results is clinically relevant given the relatively young age of treated patients and their good life expectancy. Predictive factors of late results have been identified, but there is currently no method for easily assessing the prognosis of individual patients. This is of particular importance given the diversity of patient subsets in mitral stenosis. The present study reports the longest follow-up, up to 20 years, in a population of 1024 patients with diverse characteristics who underwent percutaneous mitral commissurotomy. We found that 30% of patients had good functional results at 20 years, ie, survival without cardiovascular death or mitral intervention and in New York Heart Association class I or II. In the 912 patients who had good immediate results from percutaneous mitral commissurotomy, we analyzed the predictive factors of late functional results. This study highlights that, besides final mitral valve area, final gradient is a strong predictor of late functional results and thus should also be systematically considered in the evaluation of the immediate results of percutaneous mitral commissurotomy. From the predictive factors identified, we derived a user-friendly score combining 7 variables enabling the probability of good functional results to be assessed in any given patient with good discrimination and concordance between predicted and observed rates. The wide application of this original and simple score should be encouraged in current practice to improve individualized patient information and follow-up.

Conclusions—Twenty years after percutaneous mitral commissurotomy in a population of patients with varied characteristics, 30% still had good functional results. Prediction of late functional results is multifactorial and strongly determined by age and the quality of immediate results. A simple validated scoring system is useful for estimating individual patient outcome.11

Short- Versus Long-Term Duration of Dual-Antiplatelet Therapy After Coronary Stenting: A Randomized Multicenter Trial

Summary—This study focusing on 2013 patients undergoing coronary stent implantation who received bare-metal, zotarolimus-eluting, paclitaxel-eluting, or everolimus-eluting stent implantation and were subsequently allocated to up to 6 months versus 24 months of clopidogrel therapy in addition to aspirin failed to show the anticipated superiority of long-term duration of dual-antiplatelet therapy in terms of a lower composite ischemic end point of overall death, myocardial infarction, or cerebrovascular accidents. The cumulative risk of the primary outcome at 2 years was 10.1% with 24-month dual-antiplatelet therapy compared with 10.0% with 6-month dual-antiplatelet therapy (hazard ratio, 0.98; 95% confidence interval, 0.74–1.29; P=0.91). The individual risks of death, myocardial infarction, cerebrovascular accident, or stent thrombosis did not differ between the study groups; however, there was a consistently greater risk of hemorrhage in the 24-month clopidogrel group according to all prespecified bleeding definitions, including the recently proposed Bleeding Academic Research Consortium classification. Two Korean studies have also previously reported a lack of benefit of either 12 or 24 months of clopidogrel therapy over 6 or 12 months of therapy, respectively. Therefore, altogether, the available evidence does not support the concept that the longer the duration of clopidogrel therapy after drug-eluting stent implantation, the better the outcomes. On the contrary, this study identifies the potential for harm with respect to major bleeding associated with prolonged use of dual-antiplatelet therapy.

Conclusions—A regimen of 24 months of clopidogrel therapy in patients who had received a balanced mixture of drug-eluting or bare-metal stents was not significantly more effective than a 6-month clopidogrel regimen in reducing the composite of death due to any cause, myocardial infarction, or cerebrovascular accident.12

Comparative Outcomes for Patients Who Do and Do Not Undergo Percutaneous Coronary Intervention for Stable Coronary Artery Disease in New York

Summary—Little is known about the relative frequencies of different treatments that patients receive after being diagnosed with stable coronary artery disease and what the comparative outcomes are for routine medical treatment (RMT) versus percutaneous coronary intervention (PCI) with RMT for patients not in randomized controlled trials. Consequently, patients with stable coronary artery disease undergoing cardiac catheterization in New York State between 2003 and 2008 were followed up to determine the treatment they received. Patients receiving RMT and patients receiving PCI with RMT were propensity matched through the use of 20 factors that could have a bearing on outcomes. The resulting cohort of 933 matched pairs was used to compare mortality/myocardial infarction (MI), mortality, MI, and subsequent revascularization rates. Most of the patients (89%) underwent PCI. PCI/RMT patients had significantly lower adverse outcome rates at 4 years for mortality/MI (16.5% versus 21.2%; P=0.003), mortality (10.2% versus 14.5%; P=0.02), MI (8.0% versus 11.3%; P=0.007), and subsequent revascularization (24.1% versus 29.1%; P=0.005). Adjusted RMT/PCI hazard ratios were 1.49 (95% confidence interval, 1.16–1.93) for mortality/MI and 1.46 (95% confidence interval, 1.08–1.97) for mortality. There were no differences in treatment outcomes for patients <65 years of age or for patients with single-vessel disease. Most patients with stable coronary artery disease in New York undergoing catheterization between 2003 and 2008 received PCI, and those patients who received PCI experienced lower mortality, mortality/MI, and revascularization rates. The reasons for this finding need to be better understood, including the possible role of low medication adherence rates that have been found in other studies.

Conclusions—Most patients with stable coronary artery disease in New York undergoing catheterization between 2003 and 2008
Validation of the Bleeding Academic Research Consortium Definition of Bleeding in Patients With Coronary Artery Disease Undergoing Percutaneous Coronary Intervention

Summary—Available evidence demonstrates that occurrence of bleeding in patients undergoing percutaneous coronary intervention (PCI) signifies a worse clinical outcome compared with patients who do not bleed. Differences in the bleeding definition represent an important confounding factor that hinders the ascertainment of true bleeding occurrence and its association with clinical outcome and implementation of preventive/reducing strategies. Recently, a consensus report from the Bleeding Academic Research Consortium (BARC) proposed a standardized bleeding definition with a hierarchical approach of describing bleeding severity in patients receiving antithrombotic therapy. The BARC document is a consensus report rather than a data-based analysis and has not yet been validated. In this study, we investigated the relationship between bleeding as defined by the BARC consensus document and 1-year mortality in patients undergoing PCI and assessed whether the BARC bleeding definition is superior to Thrombolysis in Myocardial Infarction (TIMI) and Randomized Evaluation in PCI Linking Angiomax to Reduced Clinical Events (REPLACE-2) bleeding definitions. The study represents a pooled patient-level analysis of 12 459 patients recruited in 6 Intracoronary Stenting and Antithrombotic Regimen (ISAR) clinical trials. The present study found a close association between bleeding defined by BARC and 1-year mortality after PCI. The BARC bleeding definition criteria offer a balanced combination of laboratory and clinical metrics for bleeding recognition and a detailed hierarchical grading system of its severity that is closely associated with increased risk of death up to 1 year after PCI. However, all 3 bleeding definitions (BARC, TIMI, and REPLACE-2) provide comparable prognostic information with respect to 1-year mortality in patients with coronary artery disease undergoing PCI.

Conclusions—The present study demonstrated a close association between bleeding events defined according to BARC and 1-year mortality after PCI.

Randomized Comparison of Everolimus-Eluting and Sirolimus-Eluting Stents in Patients Treated With Percutaneous Coronary Intervention: The Scandinavian Organization for Randomized Trials With Clinical Outcome IV (SORT OUT IV)

Summary—Among drug-eluting stents released to date, the sirolimus-eluting stent has demonstrated the least amount of late lumen loss, but its efficacy and safety have not been compared head-to-head with the next-generation everolimus-eluting stent. The Scandinavian Organization for Randomized Trials with Clinical Outcome IV (SORT OUT IV) trial compared the everolimus-eluting stent with the sirolimus-eluting stent in patients with coronary artery disease. The primary end point was a composite of safety (cardiac death, myocardial infarction, definite stent thrombosis) and efficacy (target vessel revascularization) parameters. A total of 1390 patients were assigned to receive the everolimus-eluting stent and 1384 patients to the sirolimus-eluting stent. At the 9-month follow-up, 4.9% of the patients treated with the everolimus-eluting stent compared with 5.2% of the patients treated with the sirolimus-eluting stent experienced the primary end point (P for noninferiority=0.01). At the 18-month follow-up, this difference remained. The rate of definite stent thrombosis was higher in the sirolimus-eluting group compared with the everolimus-eluting group (0.9% versus 0.2%). The everolimus-eluting stent was found to be noninferior to the sirolimus-eluting stent.

Conclusions—The everolimus-eluting stent was found to be noninferior to the sirolimus-eluting stent.

Very Late Coronary Stent Thrombosis of a Newer-Generation Everolimus-Eluting Stent Compared With Early-Generation Drug-Eluting Stents: A Prospective Cohort Study

Summary—Early-generation drug-eluting stents releasing sirolimus (SES) or paclitaxel (PES) are associated with an increased risk of very late stent thrombosis with an annual incidence of 0.5% to 0.6%. It is unknown whether the risk of very late stent thrombosis persists with newer-generation everolimus-eluting stents (EES). A total of 12 339 patients undergoing treatment with either SES, PES, or EES between 2002 and 2009 were followed up for up to 4 years to compare the incidence of stent thrombosis between stent types with particular focus on very late stent thrombosis. The incidence rate of stent thrombosis through 4 years was lower among EES-treated patients (1.4%) compared with patients treated with SES (2.9%; P<0.0001) and PES (4.4%; P<0.0001). The reduction in stent thrombosis was most prominent during the very late time period (>1 year) with a 67% (EES versus SES) and 76% (EES versus PES) risk reduction in favor of EES. The annual incidence rate of very late stent thrombosis amounted to 0.2% in EES, 0.5% with SES, and 0.8% with PES. The lower risk of cardiac death or myocardial infarction with EES compared with PES (hazard ratio, 0.67; 95% confidence interval, 0.58–0.77; P<0.0001) was directly related to the lower risk of stent thrombosis–associated events. Newer-generation EES improve clinical outcome by reducing the risk of stent thrombosis compared with early-generation drug-eluting stents during long-term follow-up. The important reduction of the risk of very late stent thrombosis with the unrestricted use of EES overcomes the principal limitation of early-generation drug-eluting stents and constitutes an important advance in drug-eluting stent safety.

Conclusions—Current treatment with EES is associated with a lower risk of very late stent thrombosis compared with early-generation drug-eluting stents.

Percutaneous Coronary Intervention in Patients With Severe Aortic Stenosis: Implications for Transcatheter Aortic Valve Replacement

Summary—Outcomes of percutaneous coronary intervention (PCI) in patients with severe aortic stenosis (AS) and coronary artery disease are largely unknown. With the advent of transcatheter aortic valve replacement (TAVR), PCI in patients with severe AS warrants a fresh appraisal. In this study, we identified that the risk of PCI in patients with severe AS is similar to that in other high-risk PCI populations. The highest 30-day mortality risk was seen in patients with low ejection fraction (≤30%) and high Society of Thoracic Surgeons score (≥10). These results provide some insight for the management of patients with severe coronary artery disease and AS who present for TAVR. In patients with very low ejection...
fraction or severe multiple comorbidities, performing TAVR first to improve cardiac hemodynamics and function could be life-saving, although the 12-month mortality of 24% in high-risk but operable TAVR patients in the Placement of Aortic Transcatheter Valve Trial (PARTNER) suggests that there is much to learn about patient selection. In selected patients, PCI may have to be performed before TAVR to improve procedural safety of TAVR. For some patients, combined TAVR and PCI can be considered with or without adjunctive use of support devices. The optimal approach to patients with severe AS and coronary artery disease should be individualized on the basis of the relative impact of coronary artery disease and AS on the clinical presentation and the nature of the comorbidities. We hope that, as the volume of experience in TAVR increases and more data become available, evidence-based treatment strategies for patients with severe AS and coronary artery disease will emerge.

Conclusions—PCI can be performed in patients with severe symptomatic AS and coronary artery disease without an increased risk of short-term mortality compared with propensity-matched patients without AS. Patients with ejection fraction ≤30% and Society of Thoracic Surgeons score ≥10% are at a highest risk of 30-day mortality after PCI. This finding has significant implications in the management of severe coronary artery disease in high-risk severe symptomatic AS patients being considered for transcatheter aortic valve replacement.17

Very Late Stent Thrombosis and Late Target Lesion Revascularization After Sirolimus-Eluting Stent Implantation: Five-Year Outcome of the j-Cypher Registry

Summary—There is a scarcity of long-term data from large-scale drug-eluting stent registries with a large enough sample size to evaluate low-frequency events such as stent thrombosis (ST). Five-year outcomes were evaluated in 12,812 consecutive patients undergoing sirolimus-eluting stent implantation in the j-Cypher registry. Cumulative incidence of definite ST was low (30 day, 0.3%; 1 year, 0.6%; and 5 years, 1.6%). However, late and very late ST continued to occur without attenuation up to 5 years after sirolimus-eluting stent implantation (0.26%/y). Cumulative incidence of target lesion revascularization within the first year was low (7.3%). However, late target lesion revascularization beyond 1 year also continued to occur without attenuation up to 5 years (2.2%/y). Independent risk factors of ST were completely different according to the timing of ST onset, suggesting the presence of different pathophysiological mechanisms of ST according to the timing of ST onset: acute coronary syndrome and target of proximal left anterior descending coronary artery for early ST; side-branch stenting, diabetes mellitus, and end-stage renal disease with or without hemodialysis for late ST; and current smoking and total stent length ≥28 mm for very late ST. Independent risk factors of late target lesion revascularization beyond 1 year were generally similar to those risk factors identified for early target lesion revascularization. Late adverse events such as very late ST and late target lesion revascularization are continuous hazards, lasting at least up to 5 years after implantation of the first-generation drug-eluting stents (sirolimus-eluting stents), which should be the targets for developing improved coronary stents.18

Conclusions—Late adverse events such as very late ST and late target lesion revascularization are continuous hazards, lasting at least up to 5 years after implantation of the first-generation drug-eluting stents (sirolimus-eluting stents), which should be the targets for developing improved coronary stents.

Collagenase Total Occlusion-1 (CTO-1) Trial: A Phase I, Dose-Escalation, Safety Study

Summary—Chronic total occlusions (CTO) are common and have been identified in ≈20% to 30% of all coronary angiograms. The majority of patients are treated medically, with <10% of patients undergoing revascularization by percutaneous coronary interventions. The reluctance to attempt percutaneous coronary intervention in symptomatic patients is due in part to a lower success rate (≈70%–85%, depending on operator expertise and case selection) and prolonged procedure times. The Collagenase Total Occlusion-1 (CTO-1) trial is the first human coronary CTO experience of injecting collagenase into CTO, followed by a percutaneous coronary intervention attempt the next day. The study is based on extensive preclinical work showing that locally injected collagenase produced by Clostridium histolyticum directly into experimental CTO softens the collagen within the occlusive plaque and facilitates guide wire crossing. In the phase I, dose-escalation CTO-1 Trial, increasing doses of collagenase were successfully injected into CTO with a microcatheter. The main finding of the CTO-1 Trial is that collagenase delivery is feasible and safe, with no untoward clinical effects related to collagenase or the delivery technique. In this first-in-humans experience, the 75% success rate for guide wire crossing after collagenase treatment in 20 previously failed cases was encouraging, particularly because crossings were achieved with soft-tip guide wires in 75% of the successful cases. The CTO-1 Trial offers an innovative, biologically based approach that may improve percutaneous coronary intervention results in difficult-to-treat chronic occlusions. Future studies are needed to determine the utility of this new therapeutic approach.

Conclusions—Local delivery of collagenase into coronary chronic total occlusion is feasible and safe with encouraging guide wire crossing results in previously failed cases. Larger clinical trials are required to determine efficacy.
Six-Month Versus 12-Month Dual Antiplatelet Therapy After Implantation of Drug-Eluting Stents: The Efficacy of Xience/Promus Versus Cypher to Reduce Late Loss After Stenting (EXCELLENT) Randomized, Multicenter Study

Summary—The optimal duration of dual antiplatelet therapy (DAPT) after implantation of drug-eluting coronary stents remains undetermined. Although premature discontinuation of thienopyridine therapy was reported to be the major determinant of stent thrombosis after implantation of drug-eluting stents, some studies suggest that there is no apparent clinical benefit from DAPT for >6 months. In the Efficacy of Xience/Promus Versus Cypher to Reduce Late Loss After Stenting (EXCELLENT) trial, we compared 6-month DAPT with 12-month DAPT in patients receiving drug-eluting stents. Our trial showed that the rate of target vessel failure was not significantly different between the 6- and 12-month DAPT groups after percutaneous coronary intervention with drug-eluting stents (4.8% versus 4.3%) and that 6-month DAPT was noninferior to 12-month DAPT in the risk of target vessel failure. However, stent thrombosis tended to occur more frequently in the 6-month DAPT group than in the 12-month group (0.9% versus 0.1%). In subgroup analysis, target vessel failure occurred more frequently in the 6-month DAPT group than in the 12-month group among diabetic patients (hazard ratio, 3.16; 95% confidence interval, 1.42–7.03). Although 6-month DAPT cannot be recommended in the general population on the basis of our trial, these data may be helpful for physicians to decide the duration of DAPT case by case in real-world practice, eg, in patients with increased bleeding risk or undergoing elective surgery.

Conclusions—Six-month DAPT did not increase the risk of target vessel failure at 12 months after implantation of drug-eluting stents compared with 12-month DAPT. However, the noninferiority margin was wide, and the study was underpowered for death or myocardial infarction. Our results need to be confirmed in larger trials.31

Rates of Cardiac Catheterization Cancelation for ST-Segment Elevation Myocardial Infarction After Activation by Emergency Medical Services or Emergency Physicians: Results From the North Carolina Catheterization Laboratory Activation Registry

Summary—Regional ST-segment elevation myocardial infarction (STEMI) systems of care continue to develop and evolve, and now many metropolitan areas and states are organizing their efforts to provide timely reperfusion and intervention for an increasing number of patients. These systems now incorporate emergency medical services agencies and emergency departments as key drivers of their systems of care will inherently result in some degree of overtriage of patients. These systems now incorporate emergency medical services agencies and emergency departments as key drivers of their systems of care will inherently result in some degree of overtriage. In this statewide registry, we report the rates of cardiac catheterization cancelation (CCL) cancellation for ST-segment elevation myocardial infarction system activation by emergency medical technicians and emergency physicians in a large group of hospitals organized within a statewide program. The high rate of coronary intervention and relatively low rate of inappropriate activation suggest that systematic CCL activation by emergency personnel on a broad scale is feasible and accurate, and these rates set a benchmark for ST-segment elevation myocardial infarction systems.22

Conclusions—This represents the first report of the rates of cardiac catheterization cancelation (CCL) cancellation for ST-segment elevation myocardial infarction system activation by emergency medical technicians and emergency physicians in a large group of hospitals organized within a statewide program. The high rate of coronary intervention and relatively low rate of inappropriate activation suggest that systematic CCL activation by emergency personnel on a broad scale is feasible and accurate, and these rates set a benchmark for ST-segment elevation myocardial infarction systems.22

References


