

# Major Predictors of Long-Term Clinical Outcomes After Percutaneous Coronary Intervention for Coronary Bifurcation Lesions With 2-Stent Strategy

## Patient-Level Analysis of the Korean Bifurcation Pooled Cohorts

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### ABSTRACT

**OBJECTIVES** This study investigated the long-term outcomes and predictors of target vessel failure (a composite of cardiac death, myocardial infarction, stent thrombosis, or target vessel revascularization) in patients with bifurcation lesion treated by percutaneous coronary intervention (PCI) utilizing the 2-stent strategy with a drug-eluting stent (DES).

**BACKGROUND** There are limited data on outcomes of the 2-stent strategy in bifurcation PCI.

**METHODS** Patient-level pooled analysis was performed with patients undergoing PCI with 2-stent strategy from the Korean Bifurcation Pooled Cohorts.

**RESULTS** A total of 951 patients (70.7% men) with a median age of 64 years underwent bifurcation PCI with the 2-stent strategy. True bifurcation was observed in 73.2% of patients and 39.1% of patients had left main bifurcation lesions. The crush technique was used most frequently (44.4%) and final kissing ballooning was performed in 83.6%. The 3-year cumulative incidence of target vessel failure, cardiac death, myocardial infarction, stent thrombosis, and target vessel revascularization was 17.0%, 2.3%, 2.5%, 1.7%, and 14.3%, respectively. The independent predictors of target vessel failure were left main bifurcation (adjusted hazard ratio [HR]: 2.09; 95% confidence interval [CI]: 1.43 to 3.03), high Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery (SYNTAX) score (>32; adjusted HR: 2.00; 95% CI: 1.28 to 3.14), diabetes mellitus (adjusted HR: 1.41; 95% CI: 1.00 to 1.99), second-generation DES (adjusted HR: 0.26; 95% CI: 0.12 to 0.57), use of noncompliant balloon (adjusted HR: 0.53, 95% CI: 0.36 to 0.79), and final kissing ballooning (adjusted HR: 0.44; 95% CI: 0.29 to 0.68).

**CONCLUSIONS** 2-stent strategy with DES is associated with feasible procedural and acceptable long-term clinical outcomes in bifurcation PCI. Several characteristics were identified as important periprocedural predictors of long-term adverse outcomes. (J Am Coll Cardiol Intv 2016;■:■-■) © 2016 by the American College of Cardiology Foundation.

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**ABBREVIATIONS  
AND ACRONYMS**

- CI** = confidence interval  
**DES** = drug-eluting stent(s)  
**FKB** = final kissing ballooning  
**HR** = hazard ratio  
**IQR** = interquartile range  
**MV** = main vessel  
**PCI** = percutaneous coronary intervention  
**QCA** = quantitative coronary angiographic  
**SB** = side branch  
**SYNTAX** = Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery  
**TVF** = target vessel failure

Coronary bifurcation accounts for 15% to 20% of all percutaneous coronary interventions (PCIs) and remains among the most challenging lesions in interventional cardiology in terms of procedural success as well as long-term clinical outcomes (1). Although the current guidelines recommend the provisional 1-stent strategy as the preferred approach (class I, level of evidence A) (2), the 2-stent strategy remains a viable option for a minority of patients who have complex true bifurcations. To date, however, there is limited information on long-term clinical outcomes after drug-eluting stent (DES) implantation for coronary bifurcation lesions with the 2-stent strategy. The aims of this study were to evaluate the long-term clinical outcomes and identify independent predictors of adverse outcomes after implantation

of DES in bifurcation lesions with the 2-stent strategy using a patient-level pooled data from dedicated, large-scale, real-world registries.

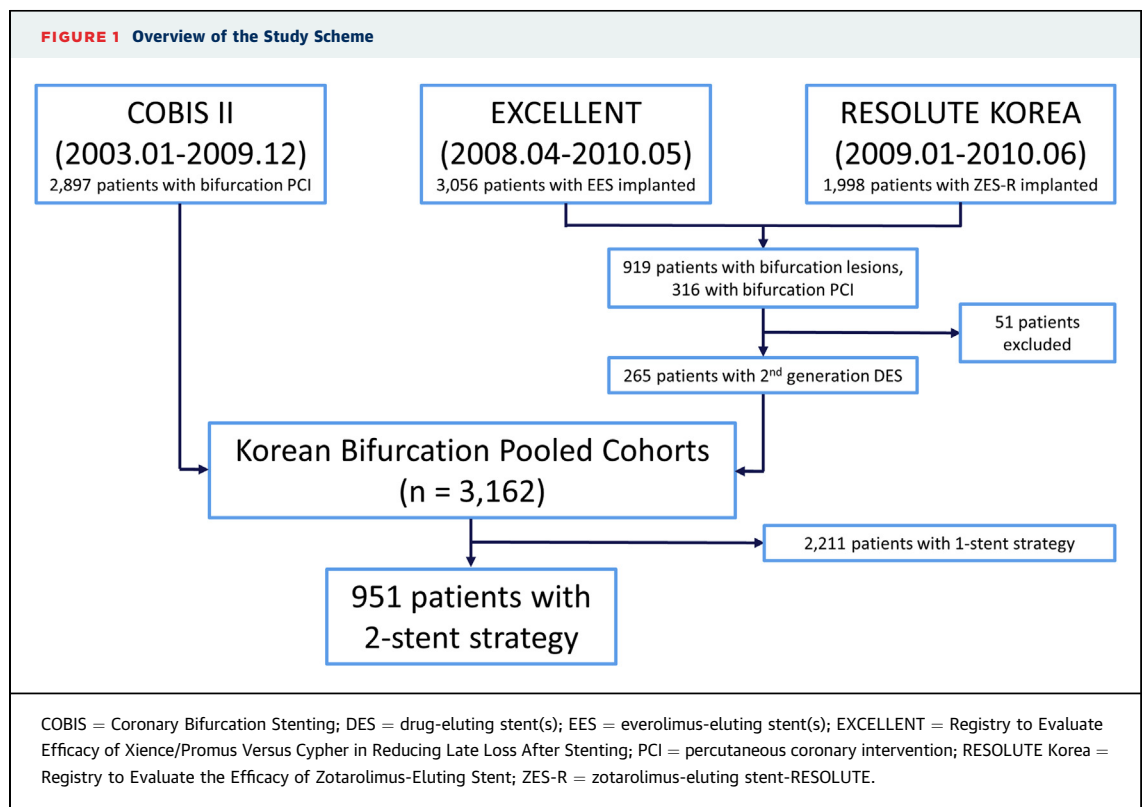
**METHODS**

**STUDY POPULATION.** The analysis population of this study was the Korean Bifurcation Pooled Cohorts,

which includes 3 different registries, the COBIS (Coronary Bifurcation Stenting) II registry (NCT01642992), the EXCELLENT (Registry to Evaluate Efficacy of Xience/Promus Versus Cypher in Reducing Late Loss After Stenting) (NCT00960648), and the RESOLUTE-Korea (Registry to Evaluate the Efficacy of Zotarolimus-Eluting Stent) (NCT00960908) in Korea (3-5). Extended description of study population is presented in the [Online Appendix](#). The final sample size of the Korean Bifurcation Pooled Cohorts was 3,162 patients. Among these patients, 951 patients were treated with 2-stent strategy and were included in the analysis (Figure 1). The local institutional review board at each hospital approved this study and waived the requirement for informed consent for access to each institution's PCI registries.

**PCI.** All interventions were performed according to current standard PCI guidelines. Decisions to treat bifurcation lesions by a 1- or 2-stent strategy were made by the individual operators. The access, type of DES, stenting techniques, and use of intravascular ultrasound or glycoprotein IIb/IIIa receptor inhibitors were all also left to the operator's discretion.

**DATA COLLECTION AND ANALYSIS.** Clinical, angiographic, procedural, and outcome data were collected with the use of a web-based reporting system.



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