Original Article

Impact of prior coronary stenting on the outcome of subsequent coronary artery bypass grafting

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ARTICLE INFO

ABSTRACT

Background: The percentage of patients referred for coronary artery bypass grafting (CABG) who have previously undergone percutaneous coronary interventions (PCIs) is increasing. The purpose of this study was to review the outcomes of patients who had received coronary stenting before CABG, and to examine the validity of a mortality risk stratification system in this patient group.

Methods: From 2010 to 2012, 439 patients who underwent isolated CABG at our medical center were reviewed. The patients were divided into two study groups: those who had previously received coronary artery stenting (97 patients, 24.7%), and those who had not (342 patients, 75.3%). The patients who received balloon angioplasty were excluded.

Results: There were no significant differences in baseline characteristics. The prior stenting group had a lower risk of mortality, although the difference was not significant. The prior stenting group had fewer graft anastomoses ($p = 0.005$), and hence a significantly shorter cardiopulmonary bypass time ($p = 0.045$) and shorter aortic cross-clamping time. Surgical mortality was similar between the two groups. The durations of intensive care unit stay and hospitalization were also similar. The discriminatory power of the logistic European System for Cardiac Operative Risk Evaluation (EuroSCORE) was lower in both group.

Conclusions: Prior coronary stenting does not affect short-term mortality in patients subsequently undergoing CABG surgery. The EuroSCORE does not predict perioperative mortality well for the patients who undergo coronary stenting before CABG.

At a glance commentary

Scientific background on the subject

More and more patients being referred for CABG have previously received a PCI. A less than favorable outcome in patients who receive PCI before CABG has been reported in several studies. The discriminatory power of current mortality risk stratification systems was not studied in these patients.

What this study adds to the field

Prior coronary stenting did not increase the risk of in-hospital mortality in patients subsequently undergoing CABG. However, the quality of CABG was not identical between the two groups. A heart team responsible for revascularization can never be emphasized too much.

A national report from the US showed a substantial decrease in coronary artery bypass grafting (CABG) surgery and a steady percutaneous coronary intervention (PCI) rate from 2001 to 2008 in US hospitals [1]. In addition, more patients being referred for CABG have previously received a PCI. It has been reported that 6–13% of patients with bare metal stent implantation require CABG surgery within 1 year, and that 13–26% of patients require CABG surgery within 10 years [2,3]. Furthermore, with the increasing popularity of drug-eluting stents, the percentage of patients with prior PCIs referred for CABG will only increase.

A less than favorable outcome in patients who receive PCI before CABG has been reported in several studies [4–6]. Inflammatory reactions caused by the presence of intracoronary stents involving distal coronary arteries and myocardium could possibly affect the optimal site of CABG [7,8]. In contrast, some studies have concluded that previous PCI does not increase the risk of mortality in subsequent CABG [9,10]. However, few studies have evaluated the impact of previous PCI on the discriminatory power of current mortality risk stratification systems including the Society of Thoracic Surgeons' risk model (STS) and the European System for Cardiac Operative Risk Evaluation (EuroSCORE) to predict post-CABG outcomes. The aim of this study, therefore, was to review real-world outcomes of isolated CABG at our medical center and to compare the STS and EuroSCORE systems in predicting postoperative mortality in patients undergoing isolated CABG who had previously received a PCI.

Materials and methods

Study design and data collection

We performed a systemic review of our open heart electronic database. This post-hoc analysis was approved by our Institutional Review Board (IRB104-8747B). Informed consent was waived due to the retrospective nature of the study design. Over a 36-month period from January 2010 to December 2012, 439 patients who underwent isolated CABG at our medical center were reviewed. The patients were divided into two study groups based on whether they had received prior coronary artery stenting (prior stenting group, 97 patients, 24.7%) or not (no stenting group, 342 patients, 75.3%). Patients who had received balloon angioplasty were excluded, and those who had undergone concomitant procedures including valvular surgery and aortic surgery were also excluded. All cases of isolated CABG including elective, emergency, urgent, and redo cases were reviewed.

The baseline characteristics, demographic data, preoperative status, and preoperative medications were recorded. Perioperative risk was stratified by using both the STS and EuroSCORE systems. Logistic EuroSCORE and EuroSCORE II values were calculated using online software.

Procedure

All surgeries were performed after standard sternotomy. On-pump or off-pump CABG was performed depending on the preference of the surgeon. Surgical details including the number of distal anastomoses, cardiopulmonary bypass time and aortic cross-clamping time were recorded and analyzed.

Measurements and statistical analysis

The primary endpoint was all-cause in-hospital mortality. Continuous variables were presented as mean ± one standard deviation (SD) unless stated otherwise. Categorical variables were presented as numbers and proportions. The Kolmogorov–Smirnov test was used to examine normal distribution, and the Student's t-test was used to compare the means of continuous variables. If the variables were not normally distributed, the Mann–Whitney U test was used. Categorical data were compared using the chi-square test or Fisher's exact test.

The predicted risk of postoperative mortality was calculated using logistic EuroSCORE and STS scores, and the calculated mortality rate was compared with the actual mortality rate. Receiver operating characteristic (ROC) curves were plotted for both scoring systems to determine the best outcome risk model in these patients. Discrimination was assessed by comparing areas under two ROC curves (AUROC) using a nonparametric approach proposed by Delong et al. (1988). The AUROC analysis calculated cutoff values, sensitivity, specificity, and overall correctness.

Results

Characteristics of the study population

The study population included 439 patients, 97 (24.7%) of whom had previously undergone coronary stenting and 342 (75.3%) had not. The baseline characteristics including preoperative demographic data, preoperative status, and preoperative risk scores are listed in Table 1. There were no significant differences in age, gender, or underlying disorders between the two groups. There were also no significant differences in the percentage of patients in a critical condition